

THE CICS 2021 HORIZON REPORT:

FUTURE DISRUPTORS IN TECHNOLOGY, LEADERSHIP, AND BUSINESS

Dr. Dennis A. Trinkle

Cyrus Green, Christopher Nouhan, Paul Faria

*Center for Information and
Communication Sciences*

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Communication Sciences**

LEADERSHIP TEAM

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Dennis Trinkle is the Director for the Center of Information and Communication Sciences (CICS) and Director of the Applied Research Institutes at Ball State University. Dr. Trinkle brings a diverse multi-sector leadership background to his leadership of CICS, where he also holds the rank of Professor of Information Sciences and Communication. Prior to joining Ball State, Dr. Trinkle served as the system chief executive, provost, and chief academic officer for Harrison College. Dr. Trinkle has served leading institutions across the higher education, corporate, and government sectors, including serving as the chief executive officer of IHETS, chief information officer, associate vice president for academic affairs, and Tenzer Professor of Information Technology for DePauw University, and president, chief executive officer, and board chair for many companies and non-profit organizations. He is the author and editor of 17 books and more than 50 articles on entrepreneurship, technology, leadership, teaching and learning, and history. Together with Kevin Allen, CEO of EiGames, he developed the award-winning video game on the entrepreneurial process—Fireworks: The Entrepreneurship Experience (2018). His latest book: Recipes for Success: How to Start a Business was published in spring 2021.

Christopher Nouhan, Graduate Student, Center for Information and Communication Sciences

Christopher Nouhan is a Graduate Assistant for the Center for Information and Communication Sciences (CICS) at Ball State University. Prior to enrolling in CICS, Christopher attended Alma College, where he obtained a B.A. in New Media Studies. While at Alma College, he founded Bitworks Productions, a pre-professional program that bridged media students with community clients, providing professional development opportunities to his peers. Christopher has been published in the IEEE Future Directions publication for his work related to artificial intelligence in higher education. He is the co-founder and owner of N4 Studio, a digital marketing agency, and a Software Architect Analyst with Accenture.

Cyrus Green, Graduate Student, Center for Information and Communication Sciences

Cyrus Green is a Graduate Assistant for the Center for Information and Communication Sciences (CICS) at Ball State University. In April 2021, Cyrus became Ball State University's first-ever recipient of the David L. Boren Fellowship, through which the U.S. Department of Defense sponsors overseas critical language study in exchange for government service. Prior to attending Ball State, Cyrus obtained a B.A. in International Studies from Miami University, where he was the recipient of a 2020 Fulbright Award. He is a 2021 Fulbright-Hays Fellow and a Technology Analyst at Accenture Federal Services.

Paul Faria, Graduate Student, Center for Information and Communication Sciences

Paul Faria is a full-time employee with Ball State University Media Services (UMS) and an online student at the Center for Information and Communication Sciences (CICS). With UMS, Paul is a Project Lead for University and Community commissioned video productions while also serving as Lead Graphics Operator for ESPN broadcasts. In 2016, Paul completed his B.S. in Communications Media at Fitchburg State University. During his time at Fitchburg State, Paul was the Vice President of the North Central Massachusetts Entrepreneurship Club in which he initiated a partnership with United Way of North Central Massachusetts and served as student liaison to the Board of Directors.

An Introduction - Future Disruption

The Covid Pandemic has upended many technology, business, and leadership trends while accelerating and adding new urgency to others. The interplay of this disruption and acceleration is highly evident in the 2021 Horizon Report. To capture and represent this dynamic environment, this year's report takes both a wide-angle and telescopic approach to identifying the major trends in technology, business practices, and leadership practices that will drive and reshape organizations over the coming decade. Through detailed surveys, interviews, and supporting research the Center for Information and Communication Sciences research team looked at current significant trends across all sectors, zooming in to look at current states, zooming out to look at developments anticipated to emerge further out on the time horizon, and widening the long-term lens to identify and describe the synergistic effect the individual trends will have in varied combination. What we discovered is an unprecedentedly rich period of innovation across all sectors and categories. While it is difficult to anticipate clearly the ultimate outcomes of the trends identified here, we hope the trends and direction arrows identified below will help organizational leaders at all levels to better anticipate, plan, build and innovate.

Methodology

To identify the key trends identified in the Horizon Report, the research team relied upon expert surveys with more than 100 thought-leaders and top executives across diverse corporate, government, and non-profit sectors. Over 50 thought leaders participated in detailed interviews and follow-up conversations to add breadth, depth, and nuance to the analysis. These expert forecasts were supplemented with research across current literature and findings from related studies. The results represented here are based on this combined research and reflect the input of the many experts who contributed to the analysis. We are grateful to each of them for sharing their time, experience, and expertise.



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THE CICS 2021 HORIZON REPORT:

TECHNOLOGY TRENDS THAT WILL SHAPE THE NEXT DECADE

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AI & Machine Learning

1 What is it?

Artificial Intelligence (AI) is the technological effort to simulate human intelligence in machines, particularly in learning and problem-solving. AI is often used as an umbrella term that includes a variety of technologies across many different functions. It is important to note that the term “AI” covers a wide field of technology revolving around intelligent machines and code developed for problem-solving. Machine learning is frequently described as a subfield of AI that involves self-learning algorithms for such tasks as pattern recognition and predictive analytics, rather than generalized human-like intelligence. ML is often used by those who want to focus on learning algorithms focused on specific tasks. It is important to understand the distinction between these two concepts because they are frequently used interchangeably.

The types of AI that the average person is generally exposed to at present can be described as Artificial Narrow Intelligence (ANI). ANI applications are designed to solve one problem at a time. Devices like Alexa and Siri do this by playing the music upon request or adding groceries to your shopping list. ANI only operates with a limited focus and simulates human intelligence by connecting to the internet and quickly processing commands. AI is also involved in more mundane tasks such as email filtering, suggestive predictions on Netflix and YouTube, and speech detection. These are the most common consumer-facing applications with which many people are familiar. Alternatively, Artificial General Intelligence (AGI) is a system that operates with human-level cognition. This type of AI does not exist yet, and there is disagreement over when or if this level of AI will be reached. It is relatively unlikely to be achieved and in wide adoption within the coming decade, although the infrastructure is being built to make this possible and it may be achieved within the coming decade. Machine learning and narrow AI will have the greatest impact in the short and mid-term.

2 How does it work?

Artificial intelligence is a household name that has dominated headlines over the past few years, although it is often misused. AI is a field of rapidly expanding technology that was jump-started by creating the Internet and advances in computation power and storage capacity. AI refers to no single technology, but rather a combination of highly complex devices all communicating with each other to process data and react at incredible speeds. The following subsets of AI can be applied in various capacities but should be noted individually. Each of the following definitions has been simplified for ease of explanation and use:

- Machine Learning: Automates analytical model building, uses self-learning algorithms
- Deep Learning: used to learn complex patterns in large amounts of data
- Neural Networks: interconnected units (like neurons) that process information by responding to external inputs
- Natural Language Processing: to analyze, understand & generate human language, including speech
- Computer Vision: relies on pattern recognition & deep learning to recognize what's in a picture or video
- Cognitive Computing: for natural, human-like interactions with machines

Each of these different subsets of AI can be used to facilitate a variety of functions, from smartphones identifying the temperature outside to Alexa and Siri playing music. More removed from the front-end is data processing, a critical approach to using AI & machine learning that is far from the consumer's view.

AI & machine learning are actively being used to analyze the plethora of data that is accumulated from humans.

Data that would traditionally take months to organize, trace and understand can be fully optimized and evaluated in minutes or even seconds. Businesses can use this data to make better decisions in every marketplace.

3 Who's doing it?

Many large companies have been investing significant amounts of capital into furthering their capacity, application, and profitability utilizing AI and machine learning in their organizations. Amazon, Google, and Apple have made some of the most public steps toward the development of consumer-facing AI with their Internet of Things (IoT) products, such as Alexa, Siri, Google Home, and an array of other smart devices. Internally, these organizations are utilizing AI and machine learning to make their processes more efficient and cost-effective. Google, Facebook, Twitter, and other social media-driven companies utilize AI and Machine learning in ways that allow them to better target consumers with content. From Google's search engine and targeted ads to Facebook's adaptive content, predictive AI algorithms are. Following the election of Donald Trump in 2016, Facebook's role in content targeting became a worldwide topic. Situations like these showed the reality of data collection and the machine learning capabilities of massive companies. Using these technologies, businesses can better understand what type of content consumers want to see, what content will elicit positive or negative reactions, and what content will drive the highest engagement.

Taking a step back from the largest users of AI and machine learning, these technologies can also be incredibly useful for small businesses, digital startups, and even colleges and universities. Advertising companies use machine learning algorithms to target their customers more efficiently. E-commerce has exploded due to the predictability and learning mechanisms of online platforms and their associated technologies. Small businesses are taking advantage of time-saving AI functions that reduce risk, lower costs, and improve flexibility and results.

Businesses that use customer relationship management (CRM) software have benefited substantially from the implementation of stronger AI and machine learning systems. Salesforce, a CRM software leader, helps small businesses analyze and track

customer satisfaction and feedback while automatically making adjustments to lead acquisition strategies.

Chatbots and automated help systems are commonplace on almost every website. These are partially operated by fully autonomous systems that rely on AI and machine learning technologies to learn and provide a better customer experience. Additionally, when hiring, AI can become incredibly useful by optimizing human resource tasks like resume reviews and confirming qualifications. Although big players dominate the headlines as they use these systems, the opportunity for small businesses and organizations to take advantage of these technologies is increasing.

4 Why is it significant?

The incredible advances taking place will have lasting impacts that ripple through every aspect of society. The amount of data that is consistently generated by the human race far outpaces our ability to organize, analyze, and interpret that data into meaningful insights. Computers are incredibly efficient at calculating, and can do it much faster than a human counterpart. As technology services continue to collect record amounts of data, there will be an increased need for AI to analyze and make decisions based on its learnings. The amount of data created, tracked, and shared has never been higher, and AI allows for greater insight into that data than ever before.

The impacts that AI and machine learning are affecting all sectors, including finance, transportation, criminal justice, smart cities, entertainment, and many more. AI will continue to augment human capabilities and open the door for further efficiencies in all aspects of our lives. PriceWaterhouseCoopers identified that "artificial intelligence technologies could increase global GDP by \$15.7 trillion, a full 14%, by 2030 [1]," solidifying the significance of these technology systems and their future impact potential on global commerce.

With most developed countries investing billions of dollars into the development and understanding of these technologies, it is clear that the far-reaching industry impact will be great. AI is the key to successfully managing the complexity of an interconnected world.

There are a variety of specific advantages that are not inherent to one industry or practice. These include a reduction in human error, increased operable availability, and communication advancements. AI and machine learning make decisions based on data inputs and algorithms; as these technologies act, they are far less prone to the unpredictability of human error. With most automated technologies comes the chances of increased capacity to work and longer stretches of availability. Compared to a standard 8-hour workday, an AI can manage other systems constantly. This can be applied to a variety of industry-specific instances, and the far-reaching implications of increased productivity are clear. Last, and possibly the most critical, are the advancements regarding AI's ability to directly impact and enable more effective communication. Most people are aware of language translators such as Google Translate, and the advances that have been made in that space over the last decade. There are now technologies that can translate information live without having a trained human translator present. Advances like these have the potential to impact billions of people across an array of industries and practices.

5 What are the downsides?

With the wide-ranging application of AI comes the potential for negative impacts. There are a variety of legitimate concerns surrounding the widespread investment of AI and machine learning technologies, including job loss, data abuse, human agency, socio-economic impacts, ethical implications, and a lack of development standards. While AI and machine learning will likely create new jobs, opportunities, and fields of thought, it has the potential to exacerbate the current skills gap and increase job loss in various industries. With these developments, there will likely need to be investments into reskilling campaigns for those who lose jobs due to AI. To identify which jobs will be vulnerable, one can recognize how routine the job functions of the role are - the more routine, the easier it will be to replace that position with an AI.

As the skill gap widens and more jobs are lost, the potential for lasting social upheaval increases. Marina Gorbis, Executive Director of the Institute for the Future, said, "Without significant changes in our political economy and data governance regimes, [AI] is likely to create greater economic inequalities, more

surveillance, and more programmed and nonhuman-centric interactions [2]." Additionally, the rise of Big Data creates the risk of data abuse; as the demand and marketplace for data expand, so does the potential for oversharing, leading to privacy and security risks. This indicates a lull in AI development standards, which can lead to systems being unable to collaborate and create bigger inefficiencies. With this lack of standards and different operating procedures, there are AI that may discriminate against individuals of different races, ethnicities, and genders due to biased training data that was used to develop the system. This can lead to greater inequalities and makes accountability incredibly difficult to pinpoint. As AI and machine learning continue to be integrated into many aspects of daily life, there will be an emerging need to protect users' data, counter the growing inequality and skills gaps, and strengthen software standards. These factors will play a critical role in the fair and equitable expansion of artificial intelligence throughout society.

6 Where is it going?

Three different types of AI are categorized according to their functionalities. The first is Artificial Narrow Intelligence (ANI), which can be described as a machine specializing in one particular problem area for which it is tasked with finding a solution. The second type is Artificial General Intelligence (AGI), which refers to a computer that could be classified to be as smart as the human brain in every way. The third type is called Artificial Super Intelligence (ASI), which can be defined as an intelligent entity smarter than the most intelligent human brain in every field. The only kind of AI that exists today from these three types is ANI, which has a narrow focus on single objectives described earlier.

The future of AI and learning is explosive and far spread. These technologies will impact every industry, from transportation to customer service if they haven't already. We can expect that self-driving vehicle fleets will one day operate autonomously throughout urban environments. AI-equipped robots will empower manufacturers to increase output and decrease cost, enabling traditional limits to be expanded. The healthcare and education sectors will experience incredible amounts of change, including AI supporting disease discovery and classroom tutors that can increase student engagement. Every

industry will be impacted by AI and machine learning over the next decade.

Industry Forecast

Thought Leader: Matt Becker

Position: Managing Partner, BDO USA, LLP

Area for Disruption: Resource allocation as automation frees up teams from low-value tasks.

Professional Insight:

“To be sustainable, the delivery of professional services needs to be more portable. When we look at automation, it does really well with low-value tasks. For example, when looking at a client’s general ledger, the person working with it needs to determine “this account has to be allocated on this part of the tax return.” This can be done with automation. We’re a long way away from it materially performing the high-value ads that involve complex laws and regulations with various business structures. As automation frees up our team from the low-value activities, we have to determine how to allocate our resources into professional training. Now, you can’t go to a national conference or large meeting in a conference room. How do we develop our virtual connectivity to be able to provide many of these components that you got from those in-person events?”

Industry Forecast

Thought Leader: Bettyjo Bouchey

Position: Associate Dean at National Louis University

Area for Disruption: Potential for educational institutions to adapt to the changing environment of AI and ML.

Professional Insight:

“Both [AI and machine learning] will work in concert. The rise of remote teaching, learning, and working will enable more consolidation of places of leaning (and perhaps worshipping) to allow only the best and brightest to co-construct new knowledge with students, faculty, staff, and community leaders

-- literally blowing up the academy walls and creating durable cyber connections to the outside world. Along with this, machine learning and AI will transform how students consume baseline knowledge so that the classroom is used for innovation and world changing liberation of ideas. Because the academy has been “the space of mind” for a long time, and too often using the factory model of teaching and learning where students are only meant to consume and produce the same knowledge, over and again. Graduates leave with the same set of skills that the person next to them does, and only the extraordinary can rise above that. If we continue to keep education upended, the only thing holding back a new graduate is their sheer will. If the US can capitalize on this education disruption, we can regain our global position by creating oceans of innovation and creativity -- we can find new ways of fighting disease, controlling climate change, and block nefarious meddling by other nations. We cannot do these things without creating a platform for young minds to break free from the confines of the old ways of thinking that got us to where we are right now.”

Informational Resources

[What is AI](#)

[How AI is Transforming the World](#)



Internet Connectivity & 5G

1 What is it?

5G is the newest generation of cellular radio technology, enabling speeds much faster than 4G or earlier generations. As with all cellular radio technology that precedes it, 5G requires towers to spread frequencies in local areas, and it requires that cell-phones and other devices have their own 5G antenna to tap into the network. As such, the availability of 5G technology is highly dependent on its implementation by cellular network providers, which in turn means that rollout of the technology will be prioritized in more developed communities around the world before spreading to more rural and/or less developed areas.

Major strides have been made in the construction of 5G data networks and the distribution of cell phones with 5G antenna capabilities. Businesses have begun to leverage the enhanced capabilities of 5G technology to improve internal and external communication, as well as other aspects of a business.

In particular, businesses in Asia are expected to take advantage of the benefits provided by 5G. Special attention must be paid to China, which is where much of the innovation surrounding this technology has originated. Furthermore, China is making the most active, centralized efforts to integrate 5G technology into its normal business models.

2 How does it work?

5G technology is defined by several components, including fiber-optic cabling and advanced radio waves that sit in a high-frequency band between the 28 GHz to 38 GHz range. This range is called a millimeter-wave spectrum and allows for incredible amounts of data transmission. Verizon identifies the millimeter-wave spectrum as “the widest, fastest highway on the planet, with millions of trucks

traveling centimeters apart from one another at unbelievable speeds - smoothly [3]”. Additionally, the latency (time required for data to travel between two points) is significantly lower with 5G, dropping below 10 milliseconds in most cases.

Two primary components make 5G possible: small cells and fiber-optic cabling. Small cells are transmitter devices that can be strategically placed throughout environments such as cities, metropolitan centers, and even playgrounds. They are placed in areas where the demand for connection is highest, such as business centers and universities. These transmitters act as boosters to amplify the strength of a 5G connection and will be integrated into next-generation antennas: “new antennas will incorporate new technology known as massive MIMO (multiple inputs, multiple outputs), which enables multiple transmitters and receivers to transfer more data at the same time [4]”. Additionally, fiber-optic cabling allows data to be transferred at the speed of light with very low latency. Data can not only travel hundreds of miles at incredible speeds but can be amplified in areas that create the highest demand. These network architecture advancements create the backbone of 5G and data movement, allowing for faster speeds that consumers and businesses can take advantage of.

3 Who's doing it?

China is a leader in the implementation of 5G technology, and they are using it in innovative ways to improve their industry communication capabilities. China has the greatest number of cities with 5G connectivity in the world, with 341 5G-enabled cities compared to 279 in the United States. Leading the charge are Chinese telecommunications giants ZTE and, most prominently, Huawei, which has finalized more 5G contracts than any other telecom company.

Huawei's influence expands far beyond Asia and encompasses networks across Europe and Africa, but that influence has been subject to significant U.S. scrutiny and sanctioning due to concerns of political motivation and espionage. As the Chinese Communist Party wields a high degree of influence over Chinese corporations, they have levied this influence to establish a high degree of integration in the implementation of 5G technology with regards to inter-industry and intra-industry communication. Essentially, China is taking advantage of the high speeds provided by 5G to push forward with the technologies that benefit most from these high data speeds, such as cloud computing and drone technology. With the added benefits of 5G, these technologies can be used to increase the economic efficiency of Chinese businesses. It is expected that other countries in China's telecommunications zone of influence across Asia, Europe, and Africa will follow suit once they can implement 5G. Outside of China, South Korean giants Samsung and LG also occupy a significant role in 5G research, development, and deployment.

Close behind China, the U.S. is also a global leader in 5G rollouts. AT&T, Verizon, and T-Mobile are the significant drivers behind the deployment of 5G networks in North America. Also within the U.S., Cisco Systems is supporting these deployments with its 5G portfolio of services, infrastructure, and automation. While many telecommunications companies implement the deployments that bring 5G connectivity to devices, Qualcomm Technologies focuses on crafting the products that enable this connectivity. As a leading designer and producer of 5G semiconductors, this company is a pioneer in developing the components that make 5G possible. In Europe, Ericsson, Nokia, and, to a lesser extent, Orange, are mobile vendors heavily involved in the deployment of 5G networks [5].

4 Why is it significant?

The development of 5G technology is significant because of the revolutionary speed and ubiquity of the connectivity that it enables. With 5G technology, businesses will be able to accommodate travel into their work structure, as employees will be able to move larger amounts of data. For example, a graphic designer might be able to submit several gigabyte files through 5G networks while they commute, something that might not be possible with 4G

technology. This expands to other areas of the company where Wi-Fi connections are not reliable, such as on business trips or in temporary workplaces. The implications are especially significant for remote work, where increased ranges and speeds of connection will revolutionize what workers can accomplish as businesses embrace flexible, distributed working environments. Education also stands to benefit from this reach. The new possibilities for both the in-person and remote delivery of information mean that underdeveloped, emerging, and/or rural areas and nations can improve and scale the quality and reach of education.

At a high level, the significance of 5G should not be viewed within the scope of 5G technology itself. Instead, imagining the countless applications and uses of 5G speed and connectivity, particularly in other areas of technological disruption, can help frame the massive scale of change that 5G will enable. Automation, Big Data, the Internet of Things, and smart cities are only a few of the diverse industries, technologies, and concepts that will be optimized by 5G. The vast majority of wireless technology is built for and relies on 4G infrastructure; as the new 5G backbone dramatically improves the capabilities of this foundation, virtually all areas of technology will reap the benefits.

5 What are the downsides?

There are several downsides associated with the deployment of 5G network technology. First, the construction of 5G towers will be slow and will likely prioritize highly developed areas, resulting in the unequal availability and distribution of 5G networks' economic benefits. As can be seen in the current construction of 5G equipment, low-income and minority communities are generally skipped in favor of more affluent communities that are able to afford high fees for the high speeds. There are concerns that 5G network companies like AT&T will not build 5G towers in these communities at all unless the government offers incentives, as low-income consumers may lack the resources to constitute a profitable market for these companies. This problem is exacerbated when compared to 4G and previous generations because 5G technology requires significantly more infrastructure to implement, and is therefore extremely expensive; few corporations would focus their attention on communities who will not be able

to support the investment. The dynamics of 5G roll-outs could deepen the economic and technological disadvantages facing many marginalized communities.

The security risks that have led the U.S., United Kingdom, Australia, and several other nations to ban or curtail the deployment of Huawei and other Chinese-operated 5G networks in their respective territories also represent a downside of 5G. All Chinese corporations are obliged to provide the Chinese government with any data that it requests, and the government itself is often directly involved in the operations and dealings of major companies like Huawei. Given the ongoing geopolitical tensions between China and the U.S., there is a real concern that Huawei could intentionally use foreign dependence on its 5G networks as a channel for espionage, data theft, and similar actions. These security considerations have added political complexity to the worldwide contracting and deployment of 5G, creating an environment in which nations who open their networks to Chinese telecommunications companies must accept that their relationships and cooperation with the U.S. and its allies may be strained as a result.

6 Where is it going?

Much like 4G and the other generations of network technology preceding it, 5G will slowly but surely spread out to become the primary form of cellular data transmission in the United States and other developed countries. In North America, it is estimated that 48% of all connections will be on 5G networks by 2025 (behind 50% of all connections in Asia) [6]. Even as the upgrade from 4G to 5G remains an ongoing process that is far from being fully realized, China, the U.S., and other global technology leaders are already racing to begin exploring possibilities for the sixth generation of cellular technology, 6G. For now, 5G will begin to permeate the business structure around the globe, speeding up communications and increasing worker flexibility. Though the rollout will be gradual, the impacts and consequences are already being felt. Devices, systems, and organizations will harness the power of 5G to break free of previous connection and speed constraints, while societies will have to contend with the equity, security, and political challenges that the adoption of 5G will entail.

Industry Forecast

Thought Leader: Kerry Sims

Position: Vice President, Hitachi Vantara

Area for Disruption: Intelligent automation and real-time, interactive decision-making at the edge.

Professional Insight:

“The big expectation and realization is that 5G is not for people, it’s for machines. It enables you to get real-time, interactive analytics that not only drive prediction but a prescription to the edge. When you can do that, you can do intelligent and dynamic automation. It’s not just autonomous behavior like “I can drive a route from A to B,” but rather, responding to the environment in real-time and being able to dynamically draw upon information from a much broader network of sources than was ever possible and do it in real-time.”

Industry Forecast

Thought Leader: Ed Schwer

Position: National Program Manager, U.S. Department of Homeland Security

Area for Disruption: Increased productivity and free time created by 5G-enabled IoT and automation.

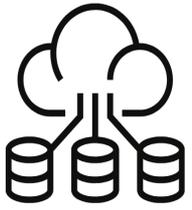
Professional Insight:

“If we had all of our technologies and IoT devices linked in a little more seamlessly, which will require greater connectivity and bandwidth, we could reduce the monotonous, mundane tasks that we as humans do every single day. Those are hours, or days over the course of a year, that you gain back. If you are a professional of any type, to be able to have extra hours to dedicate to the things that you are working on is important. Having extra hours to donate to yourself and focus on you is just as positive.”

Informational Resources

[Huawei’s 5G Dominance](#)

[Global 5G Insights and Forecasts](#)



Big Data, Analytics, Visualization

1 What is it?

Big data is the concept of amassing large quantities of data from multiple streams into one repository. Big data breaks down information silos by lumping things together and makes the data far more useful than if it would have been used independently. There is tremendous value in leveraging all the information an organization generates over time and marrying it with external sources.

Data analytics are tools and processes people use to understand data at a deeper level that provides insights. It can be as simple as a spreadsheet, but there are far more advanced tools available. These tools are geared for analysts who want to look at the data from their unique perspective and don't require deep technical skills. Consumers use analytic tools to make sense of what is going on, where things are heading, and what should be done. Data visualization is the art of turning data into visually compelling stories. Good visualization makes it easy for the consumer to see what is going on without having to process a lot of detailed information or understand complexities. Heat charts, maps, trend reports, and many other tools are examples of data visualization.

2 How does it work?

Big data works by capturing data streams that are generated by an organization over time, lumping it together with historical data, data silos, and importing it together in one repository. It is then structured and scaled in a way to make it widely available, useful, and expandable. Cloud vendors offer many services that facilitate big data for both data storage and integration.

Once the data is assembled, analytical tools can be configured to interpret it. Companies often select tools that easily integrate with or are already part of

their data storage platform. Analysts point these tools at their repositories and use them to analyze data from several perspectives, ultimately identifying fine-grained insights and making highly informed decisions.

Data visualization is created by stimulating graphical components that present meaningful information to consumers. Think of the electoral college map, weather reports showing weather patterns, or the dashboard on your car. Visualization is an effective way to keep stakeholders apprised of Key Performance Indicators (KPIs) in an organization without having a deep understanding of the content.

3 Who's doing it?

95% of companies have deployed big data initiatives at an enterprise or departmental level. Cloud computing has accelerated the ability to scale and implement big data practices in an affordable way, and the rate of data we are generating is exponentially growing. Companies are very familiar with data analysis and visualization, but there are new tools that make it easier for non-technical people to work with data as well. Data is increasingly available to be analyzed and visualized by those outside of IT - the citizen analyst.

4 Why is it significant?

The significance of big data, analysis, and visualization is that companies can make use of information in far more sophisticated and meaningful ways than before. Their data can be brought together with new sources to offer new insights and capabilities.. This can lead to companies better serving their customers and identifying problems before they become

catastrophic. Some companies are even able to use data to predict future behavior, not just analyze past results.

5 What are the downsides?

Big data doesn't come without downsides. The immediate downside is that organizations need to rethink how they approach data and analytics. They will need to adopt new technologies and learn to use them properly. Big data requires a lot of bandwidth and integration, new talent with relevant skills, and compliance initiatives. Additionally, data quality from sources may need to be improved before businesses can fully leverage its power.

Privacy and security also pose a threat. So much information is available about consumers and companies that anonymity can be lost, and that information can be exploited. Furthermore, governments may take action to regulate industries dealing in large amounts of consumer data to protect privacy and identity of users.

6 Where is it going?

Many companies have adopted big data initiatives and this trend will accelerate. Given the number of analytic tools available, look for companies to undertake standardization projects to make support more manageable. Security will continue to be at the forefront of concerns for organizations. As more and more data is assembled, look for ongoing integration and compliance challenges. Additionally, non-technical roles - the citizen analyst - will increasingly participate in the day-to-day analysis and usage of data.

Industry Forecast

Thought Leader: Jennifer Merrell

Position: Senior Relationship Manager, TechPoint

Area for Disruption: Organizations or processes that enable small and medium-sized businesses to harness their data.

Professional Insight:

"I think what's going to allow different companies to become disruptors in their industries is harnessing the data that they have. Some companies have decades of their data; it's not organized, they're not sure what to do with it, they're not sure what it's telling them. Because they haven't harnessed it, organized it, and figured out what they had, they don't know how to take those next steps. They don't even know what the questions are yet. Facebook isn't going to have trouble finding a hundred data scientists to do a project for them, but what could small and medium-sized businesses do if they were able to harness the data that they've collected over the last decade? I think that's where we could see things move and change."

Industry Forecast

Thought Leader: Daniel Chen

Position: Head of Business Development, Brightside

Area for Disruption: The democratization of data infrastructure.

Professional Insight:

"The democratization of data infrastructure will enable access in ways we've never seen before. Consumers are demanding control over their data; more transparency, security, and access. Financial data is next. Banks and credit reporting agencies control data now - they sell it to hedge funds. When will they be taken in front of Congress as social media has? It's only a matter of time; people will demand it. We're seeing disruptive tech going around the legislature - crypto, and blockchain. The U.S. is behind, due in large part to infrastructure. Regulation will have to happen."

Informational Resources

[What is Data Visualization?](#)

[9 Trends Shaping the Future of Analytics](#)

[Big Data Pros & Cons](#)



Augmented & Virtual Reality

1 What is it?

Augmented reality (AR) and virtual reality (VR) are two distinct, yet related technologies. Augmented reality involves augmenting what is seen, heard, and sensed with virtual information. AR is achieved when virtual information and objects are overlaid onto the real world, effectively meshing the power of computing with reality. This creates an enhancement of the real world with digital details such as text, images, and animation, rather than fully immersing the user. Alternatively, VR is a fully immersive experience where users are in a simulated environment. In some cases, VR technologies generate realistic sounds and images, oftentimes engaging all five senses to create a more immersive experience. This 360-degree view of a simulated environment tricks the user's brain into believing that the landscape is real. Augmented reality is the mixing of reality with computing. Virtual reality is the complete substitution or approximation of reality.

2 How does it work?

VR technologies are largely computer-generated approximations of reality. The onset of massive computing power, high-quality cameras, and widely available, small consumer devices have made this process much easier to accomplish. Companies attempt to completely immerse users by dominating one or more senses – think of glasses that completely cover the eyes and only display information made available by the computer that is configured to send video. Now, the user's sense of sight is completely controlled by a computer.

As computing power continues to grow, image processing will occur at faster speeds, enabling a seamless and integrated experience. That smoother transition causes the images observed to seem more authentic. Couple that with high-quality imaging

that was heretofore widely unavailable, and the result is a very realistic image appearing to move almost naturally in a 3-D world. As the user's head turns, tiny, electronic, gyroscopic devices can detect movement, causing the user to virtually look around. Naturally, the panoramic, 3-D picture taken can now be observed, just as if the user were in the depths of the Grand Canyon or any other simulated location. All these combined technologies – the 3-D cameras, the electronics, embedded gyroscopes, high-quality cameras, and the high-powered computing device that can fit on the user's head are relatively recent technologies that enable this type of reality to be approximated by computers. This is virtual reality.

Now, imagine all the senses could be encapsulated – sight, touch, smell, taste, sound. It's not hard to imagine a situation that would easily fool the human brain into believing it was experiencing a reality that didn't exist – a virtual reality. Augmented reality works differently, but the same underlying technologies enable it. Rather than replace what is sensed, augmented reality processes what is sensed and connects that stream with computing power to augment reality in a way that amplifies the user's experience. This is where the availability and power of the cloud are particularly useful.

3 Who's doing it?

Many companies are rolling out augmented reality and virtual reality, particularly as Covid-19 has drastically changed how users can experience the world. In a survey of more than 3,000 people in North America, Europe, and the Asia Pacific, customers' increasing willingness to try immersive technologies has inspired 64% of leading consumer brands to invest in Augmented Reality, Virtual Reality, 3D content, and 360-degree video. As a result, more companies are following suit [7].

There are two camps in the AR world – enterprise AR and consumer AR. Enterprise AR is not expected to shift dramatically, but consumer AR is, so naturally, more products are being introduced that are consumer-oriented. Most of the consumer AR products being introduced are in the form of headsets or glasses, such as the products created by nReal, Mad Gaze, and Facebook. Google and Apple may introduce a product to the market.

Each of these devices has the same basic premise – take the user’s vision and add information assembled by the vendor to it. The user then views not only the real image but also whatever the vendor determines the user should see, connected to their information sources or perhaps serving an application on a platform like nReal or Mad Gaze.

In the case of more virtual-reality-themed products, the glasses encapsulate the vision and replace it with computer-generated graphics. Many of these VR devices use smartphones for graphics and computing. Some, such as those used by gaming systems, are attached to a gaming console or computer.

nReal’s mixed reality glasses made a solid showing at CES 2020, coming a long way from previous years. They have to be tethered to an Android device, but they have built-in microphones and speakers. They track eye movements, so one can imagine how an app may be able to take advantage of the platform once connected to the cloud. Right now, a home setup and fashion app come with it. Mad Gaze replaces a computer screen with the optics on the glasses so that the user can receive calls, watch 3-D movies, navigate, modify office content, translate content between languages, send messages, and live stream.

Facebook has more than 6,000 staff on AR, VR, and hardware tasks - more than they have working on Instagram and Whatsapp. They are looking for the next computing platform after the smartphone. Interestingly enough, their glasses will not feature the type of digital overlay associated with augmented reality. They are identified as smart glasses not augmented reality, so it resembles a computing platform like Mad Gaze compared to a “true” AR that nReal is developing[8].

Google launched their Google Glass product several years ago, but except for some industrial and warehouse settings, it never had a large consumer market. Some industries are successfully implementing

Google Glass to help assembly line workers. There are also some applications in healthcare that reduce physicians’ traditional computer interface time, as well as in logistics for companies that receive help order picking to accelerate their delivery processes.

MAC Cosmetics, for example, enables customers to try their products virtually via YouTube. Buyers no longer need to go into a store or travel, they can simply try products from the comfort of their homes. Nike is doing the same thing with a shoe app that does not involve a device. Customers can size their shoes without the need to go to a store or travel. Customers of the future can take a picture of their foot, determine their shoe size, then select a shoe – perhaps even morph an old photo to see what they’d look like wearing their new kicks.

4 Why is it significant?

Augmented Reality and Virtual Reality are significant in several ways: pandemic response, the development of new computing devices, technology personalization, and the power of AI/ML/Big Data pervading all of reality.

With travel restrictions, contagion concerns, and social isolation a very real part of the pandemic response, companies have turned to AR and VR to capture the attention of their customers. People have turned to digital means to stay connected. Even Zoom backgrounds have mixed reality features, where a background of one’s choosing can be superimposed on a live data stream, simulating working from an office, exotic location, or anywhere else.

Augmented reality is part of daily life now.

One of the most significant impacts may be the next computing device. Decades ago, massive computers occupied buildings, then there were huge computers with terminals, then personal computers sitting on a desk at home, a laptop one could carry about in a backpack, then a phone or tablet that fits in a pocket.

What’s next? Will it be the glasses that can detect where the user is and what they want to do without an overt physical action like diction or movement to initiate it? The cognitive implant that interfaces brain waves with what the user asks the computer to do? The natural language processing of smart IoT devices

that take all verbal directions? A combination of all those things into one device that is smarter as it gets to know the user, able to anticipate what they want due to AI/ML and cloud connectivity? Will the mouse be relegated to the dust heap of history in the coming decades?

Think of the positive benefits that AR may have for the differently-abled. We already can see how glasses can help certain color blind people to see more color. We've seen how implants can assist the deaf in hearing. As another example, there are positive benefits that AR could have on law enforcement. By bringing in the power of the cloud with the boots-on-the-ground police officer, AR can shield the police worker from bias, more accurately document their actions, and potentially detect situations they may not be able to process in a moment of adrenaline-filled danger.

In some ways, this is already taking place. Facial recognition is already a widespread phenomenon. Potential applications like accurate identifications, instant fingerprinting, or DNA comparisons could help reduce wrongful arrests and convictions. AR detection of things like inebriation, substance presence, or general medical conditions could help reduce some of the horrible situations that result in unnecessary death. The potential applications of these technologies is extraordinary.

5 What are the downsides?

On the positive side, it can reduce the need to do a lot of rote memorization. No need to store a catalog of information that doesn't change if you can reference it seamlessly using Augmented Reality. Now, users can preserve that biological compute and storage capacity for other tasks. Still, it poses educational questions. Does society want doctors who can only help patients as long as they are connected to a machine? Is a mechanic a mechanic if they only need to point a camera at something to diagnose the problem? Of course, these technologies should enhance their capabilities.

There may be other negative impacts of augmented reality on human learning and growth, such as a potential decrease in critical thinking, attention spans, or patience. Other downsides include the high price to use them. This provides barriers to certain

economies and populations that could benefit from them. In the long term, prices will likely come down so they are more universally available. Another downside to VR and AR headsets is that they are not fashionable. Until tastes change or something desirable is introduced, the technology won't be immersive. They can be socially isolating and individual experiences, removing users from the existing environment. This can have the opposite effect if one's goal is to host an event that brings people together.

6 Where is it going?

The biggest opportunity for growth is in the consumer market, but consumers haven't bought into VR and AR products for a few reasons. Once the "killer app" is rolled out, or the aforementioned obstacles are lessened, look for this area of adoption to accelerate. That's not expected to happen in 2021. One reason adoption hasn't taken off in the consumer market is the price point. VR devices are still rather expensive. Another reason consumers are slow to adopt these devices is that the physical form factor is still awkward or unattractive. It does not wear well and looks clumsy. So, until the technology can evolve and be less imposing, it will lag in adoption by the consumer market.

The enterprise market is another story, and where the growth is at right now. Previous data suggest that the growth in Extended Reality (XR) is expected to reach an estimated market size of more than \$209 billion by 2022. XR is an umbrella term referring to all real and virtual combined environments, which includes a collection of technologies such as Augmented Reality and Virtual Reality. This will undoubtedly drive innovation and advancement in this space. Additionally, 80% of executives believe it will be important to leverage XR solutions to close the gap of physical distance when engaging with customers and their employees, according to a recent Accenture survey [9].

Training and simulation in VR are particularly adept at increasing training efficacy and trainee engagement. The pandemic has amplified this need. It supports remote training and worker enablement in a socially distanced way. There is still workflow disruption – it's not perfect – but it's good and getting better.

Industry Forecast

Thought Leader: Kerry Sims

Position: Vice President | Americas,
Digital Insights

Area for Disruption: How the blending of physical and virtual environments will lead to spatial compute and data immersion as augmented reality for the workforce.

Professional Insight:

“What we’re finding is this tremendous amount of effort going on right now to move quickly to remote hands. It’s the ability to wear a hard hat that’s got an embedded visor that enables you to look at something as a field service technician and have somebody who’s a senior, experienced person, who can’t actually be out there in the field doing this work physically anymore, to see the same thing you see and tell you what to do. It’s like putting that angel on your shoulder. I’m going to put a hard hat on you that has earplugs and an advisor that has augmented reality and cameras on there, and you’re going to be able to go into that site and somebody who’s been doing this for 30 years is now, maybe in their house, and they can see everything you see. They can tell you exactly what to do and they can give you instructions on how to fix things. And while we’re doing that, we’re capturing the video. We’re capturing the audio. We’re capturing the sensor data and we’re building contextual knowledge to enable the AI to take over that role when that supervisor is no longer around.”

Informational Resources

[Immersive Technologies](#)

[AR Trends](#)

[Pros & Cons of Virtual and Augmented Reality](#)



Cybersecurity Threats

1 What is it?

To remain competitive, reduce costs, and benefit from flexibility and scalability, virtually every business has sought to accelerate the digitization of its resources, processes, and business model. The gravitation towards information technology as the common backbone of modern industry is represented by increasing reliance on cloud computing, automation, artificial intelligence, and the many other emerging technologies that are discussed here and elsewhere. The extent to which businesses depend on computer networks for daily operations is profound, to the point that cyber functionality is synonymous with survival for most organizations.

During the pandemic, most organizations found themselves reliant on distributed technology resources and remote networking environments, many of which lacked the preparation and security needed to ensure the safety of company and user systems, devices, and data. The broad dependence of businesses on their information technology systems, elevated by the pandemic, has given new incentives to the already massive, constantly growing ecosystem of cybersecurity threats and malign actors that target those systems. Cybersecurity threats are malicious acts seeking to gain unauthorized access to, disrupt, damage, and/or steal from computers and other information technology systems. Cyber threats can take many forms, but all of them strive to accomplish one or more of these goals.

Among various strategies and tactics, these five cybersecurity threats stood out as the most damaging to businesses in 2020 and are sure to be employed by malicious actors targeting businesses in 2021 and beyond [10]:

1. Social Engineering - The malicious, psychological manipulation of humans into performing compromising actions, often by accident.
2. Ransomware - Programs that hold data and systems hostage and demand payment for release.
3. Distributed Denial of Service (DDoS) Attacks - Intentionally disrupting a server, service, or network by overwhelming it with Internet traffic.
4. Compromised Third-Party Software - Accessing and attacking an organization by compromising the systems of that organization's third-party vendors.
5. Cloud Computing Vulnerabilities - Weaknesses in cloud environments caused by misconfigurations, security gaps, and end-user mistakes that attackers exploit to target cloud systems and devices.

2 How does it work?

SOCIAL ENGINEERING:

Social engineering attacks constitute a significant portion of cyberattacks, largely due to the relative ease with which they can be executed. There are myriad strategies that attackers use to manipulate people into divulging sensitive information, often relying on and exploiting an unwitting victim's trust, stress, curiosity, and, critically, unawareness of cyber safety. The vast majority of social engineering attacks take the form of phishing attacks, which trick people into opening malicious files disguised as legitimate emails, texts, or other forms of communication.

The attacker, or social engineer, researches and gathers information on their potential target(s) to plan and execute a phishing attack that deceives the victim. For example, analyzing an individual's behavior, social media, and workplace dynamics can provide an attacker with all the information they need to send the individual an "urgent" email with infected files, trick the individual into thinking that their manager is the sender of the email, and convince the individual to open the file. According to Cisco, phishing accounts for 95% of all attacks on enterprise networks.

RANSOMWARE:

Ransomware is a type of malicious software, or malware, that denies access to a computer system or data until a ransom is paid. Phishing and other social engineering attacks are common vectors through which systems become infected with ransomware. This malware often sends messages informing users that their systems have been infected and will remain locked until a ransom is paid. Sometimes, further urgency is created by imposing a time limit alongside the ransom and threatening to damage or erase data if payment is not received. Ransomware can result in the temporary or permanent loss of access to data, as well as the financial losses caused by lost productivity and ransom payment.

DISTRIBUTED DENIAL OF SERVICE (DDOS) ATTACKS:

DDoS attacks are perpetrated by botnets, which are a network of infected Internet-connected devices running "bots", or software applications that can be used for malicious purposes. Attackers use botnets of devices compromised by malware to flood a target server, service, or network with a vast quantity of Internet traffic that overwhelms the target and causes it to crash, resulting in the denial of service. Unaware of an infection, the owners of some compromised devices may not even know that their computer is part of a botnet performing a coordinated DDoS attack or other criminal activity. Attackers can also leverage artificial intelligence to organize and execute DDoS attacks.

COMPROMISED THIRD-PARTY SOFTWARE:

In some cases, it can be easier for attackers to access a target business or organization by compromising one or more of that target's third-party vendors.

If a target seems challenging to infiltrate, attackers can identify and prey on a third-party vendor with weaker security. Once the third party has been compromised, the attackers can exploit its trusted relationship with the target to gain access that they wouldn't normally have. This threat is further compounded with the vulnerability introduced by the subcontractors of third-party vendors, who would qualify as fourth-party vendors to the target organization. A compromise in a fourth party can lead to a compromise in a third party, which can then result in the successful breach of the target organization's systems. On average, a third-party breach costs an organization \$4.29 million [10].

CLOUD COMPUTING VULNERABILITIES:

As more and more businesses migrate to the cloud, opportunities abound for malicious actors to increasingly target this environment. Attackers prey on security misconfigurations in cloud architecture, vulnerabilities in the application programming interfaces (API) that enable end-users to access cloud services, and failures to implement sufficient identity and access management best practices, such as multi-factor authentication. Between June 2019 and July 2020, the prevalence of cyberattacks on cloud systems exploded, increasing by 250% [11].

These attacks on cloud systems sought to take control of cloud servers and introduce malware through malicious container images, or infected files that deploy malware as they run. Comparable to phishing attacks, malware is hidden within seemingly innocuous container images. Many of these attacks use malware focused on mining cryptocurrency, but others attempt to establish DDoS infrastructure to launch future attacks. Among other techniques, attackers search for cloud servers without passwords and exploit unpatched systems.

3 Who's doing it?

In many cases, individual actors are to blame for the exploitation of these cyber threats. The traditional archetype of a computer-savvy hacker is still relevant today, as advances in artificial intelligence and threat techniques have given many malicious actors the tools to carry out cyberattacks from their own homes.

Incentives for this illicit activity are often financial, especially when ransomware is involved. However, monetary compensation is far from the only motivation to commit these crimes. “Hacktivists” are actors who use cybersecurity threats to carry out politically motivated attacks in support of an ideological agenda.

Generally speaking, hackers must leverage cybersecurity threats to gain access to their targets. Insider threats, however, already have internal access to their targets. Insiders can be current or former employees of an organization, or even affiliated with a third-party vendor. The knowledge, trust, and access enjoyed by insiders can make their attacks especially devastating and difficult to defend against. Insiders may be motivated by a personal grudge, greed, or even corporate espionage that could benefit a competitor (for a price). Alternatively, a perfectly content and responsible employee can also be responsible for a devastating attack through their negligence. Failure to properly and securely configure a cloud network, for example, can provide the vulnerability an attacker needs to penetrate the cloud system and wreak havoc.

Beyond lone attackers, organized groups of malicious cyber actors can pool together significant resources and personnel to execute large-scale, wide-ranging cyberattacks. Terrorists and organized crime groups are increasingly turning to cyber operations as a strategy for revenue, political muscle, influence, and intimidation. Above these groups are organizations of cybercriminals that operate on an even larger scale: state actors, particularly China, Iran, Russia, and North Korea. The governments of these nations cultivate and maintain massive numbers of sophisticated cyber threat actors who relentlessly perpetrate attacks against the governments, businesses, universities, and citizens of their adversaries, especially the U.S. These operations are commonly tied to intelligence gathering, intellectual property theft, terrorism, influence operations, and financial crimes.

4 Why is it significant?

It is difficult to overstate the significance of cybersecurity threats. The recent SolarWinds hack, described by Microsoft CEO Brad Smith as, “The largest and most sophisticated [cyber] attack ever”, originated as compromised third-party software that

penetrated the networks of some of the most sophisticated government and private sector organizations [12]. However, this high-profile cybersecurity incident is only part of the thousands of cyberattacks that occur every day in the United States alone. Since the onset of the coronavirus pandemic, the FBI has received between 3,000 and 4,000 cybersecurity complaints every day [10]. These threats can harm individuals, businesses, and government organizations in several ways, especially financially; in 2020, global losses from cybercrime surpassed \$1 trillion. Downtime alone is an expensive consequence of cybersecurity threats, as operations often grind to a halt until compromised systems are secured. These costs are compounded by the hefty sums extracted by ransomware, the theft of valuable information or data, and the enduring reputational damage that haunts a business after a cybersecurity incident. The plummeting value of SolarWinds stock after the breach emphasizes the severity of these consequences.

Given the increasing tendency of state actors like China, Russia, and Iran to exploit cybersecurity threats to exert their influence and weaken their adversaries, cybersecurity threats also carry significant consequences in the domain of national security. Cyber threats, especially those leveraged by state actors, can target critical infrastructure, military and law enforcement systems, nationwide information and communications networks, and sensitive data that resides within businesses, academia, and government organizations. Societal reliance on the Internet for commerce, transportation, communication, education, security, and nearly every other facet of daily life means that cyber threats can have massive, wide-ranging impacts on the daily life and activities of individuals and organizations.

As the start of the pandemic has marked an increase in the prevalence of cyberattacks, it has also elevated the significance of healthcare in the cybersecurity space. Vaccine development and global health have become prominent targets for cybersecurity threats, demonstrated by the cyberattacks that have increasingly sought to victimize the World Health Organization, U.S. Department of Health and Human Services, and institutions conducting COVID-19-related research [13]. Cyber threats can also have potentially deadly consequences in the area of healthcare. These threats can impede hospitals’ access to data and adversely affect patient care; in September 2020, a German hospital patient died after a cyberattack knocked out the IT systems at her place of care

and forced her to be transported elsewhere. Only a few weeks later, one of the largest medical cyberattacks in U.S. history caused computer system failures across a major U.S.-based hospital chain [14]. Cybersecurity threats pose a significant danger to the security and intellectual property of health organizations and can cripple hospital technology.

5 What are the downsides?

Cybersecurity threats pose significant challenges to individuals and organizations of all sizes. The centrality of information technology systems to the modern industry means that the protection of those systems is of the utmost importance. Cybersecurity spending frequently dominates IT budgets, but defense is much harder than offense in the cyber arena. Malicious individuals, groups, and state actors represent tireless threats that constantly probe the networks of their victims, seeking out any area of vulnerability or negligence that might grant them entry. It is relatively affordable and feasible for attackers to cast their nets wide and execute automated attacks on incredibly broad ranges of targets; as easy as these attacks are to perpetrate, all it takes is one vulnerability for an organization's entire system to be compromised.

Employees add another layer of complexity to the mission of cybersecurity defenders. Not only do insider threats constitute a significant danger that must be constantly monitored and protected against, but even trustworthy employees can unintentionally expose systems to attack, as has been stated. Social engineering in particular thrives on ignorance, gullibility, and a lack of awareness around cybersecurity threats. As such, organization-wide training for cybersecurity awareness and best practices has become time-consuming, expensive, and necessary investments for business leaders.

For every challenge that organizations face in guarding against cybersecurity threats, there are just as many downsides to remediating attacks once they occur. As these threats often take advantage of blind spots in a system or network and can be stealthily disguised, it can be difficult for an organization to even realize that it has been attacked. Constant monitoring, security audits, and network visibility are required for businesses to detect anomalies and potential breaches.

Even if an attack is identified, attribution is another downside that is especially hard to overcome in cyberspace. Certain tools or methodologies can sometimes be associated with specific individuals or groups, but the plethora of opportunities for bad actors to obfuscate their involvement means that it is often difficult to determine a specific culprit, much less hold them accountable.

Remediation itself is an arduous and frequently imperfect process. Once attackers gain access to a system, they commonly implement and hide backdoors that offer them alternative points of entry back into those systems. For defenders dealing with the aftermath of an attack, it can take months to scour for these and other lingering infections; even then, it is possible that those bad actors were not entirely rooted out, and may have some form of ongoing access. The aforementioned SolarWinds hack directly illustrates each of these remediation drawbacks. Hackers were able to lay low and remain in the sensitive networks of federal and private organizations for months before their presence was finally detected. The tactics, techniques, and procedures (TTPs) employed by the attackers were consistent with those used by Russia's intelligence services, but definitive attribution is further complicated when Russia explicitly denies any involvement. Ongoing investigations continue to explore the extent of the SolarWinds attack, and months will likely pass before the full scope of the breach can be understood.

6 Where is it going?

The increasing prominence and massive impacts of cyber threats guarantee that cybersecurity will be a leading issue with which individuals and organizations alike must contend. Accelerated by the pandemic, foundational shifts in industry and business models have created a new security environment; as such, a nuanced cybersecurity approach will be necessary to address the needs and challenges facing this novel landscape. Because many assets are now outside traditional perimeters (and this is predicted to continue to grow), organizations must again rethink security. Enter the cybersecurity mesh architecture: "a composable and scalable approach to extend security controls to distributed assets by decoupling policy enforcement from the assets being protected [15]".

A mesh network “has no centralized access points but uses wireless nodes to create a virtual wireless backbone” and “are self-healing, self-organizing and somewhat scalable, with additional capacity supplied by adding incremental nodes [16]”. This transition to a cybersecurity mesh is the transition away from a single IT network perimeter to individual perimeters around access points. Gartner further explains that “the cybersecurity mesh enables any person or thing to securely access and use any digital asset, no matter where either is located while providing the necessary level of security [15]”. This security model accommodates accelerated digital business needed by organizations and provides flexibility expected by employees while providing the appropriate asset protection.

A partner trend to cybersecurity mesh worth noting is an IT operating model designed for anywhere operations – or put simply “digital-first, remote-first” (Gartner Top Strategic Technology Trends for 2021). Anywhere operations are a key inclusion because as organizations strive for smooth, scalable digital experiences and adapt large portions of their strategy to accommodate customers and employees, security must be at the center of decision making. Brian Burke, research vice president at Gartner, explained: “as anywhere operations continue to evolve, the cybersecurity mesh will become the most practical approach to ensure secure access to, and use of, cloud-located applications and distributed data from uncontrolled devices.” While the digital transformation has been incredibly “expedited “in response to COVID-19, the cloud has become a must-have for businesses to continue operations and thrive in the future [17]. Cloud, anywhere operations and cybersecurity mesh will be a crucial partnership for organizations in the years ahead.

Industry Forecast

Thought Leader: John Pistole

Position: President, Anderson University; former Deputy Director of the FBI

Area for Disruption: The growth of cybersecurity and risk management industries as interconnected cyber threats become more pervasive and systemic.

Professional Insight:

“Ransomware is just going to continue expanding, in addition to phishing, malware, and other cybersecurity threats. These threats are interconnected and linked in a way that makes them hard to separate into unique categories. State-sponsored attacks are the most concerning because they’re typically the most sophisticated and they target national security interests, but sometimes they also target a company’s proprietary information. Trade secrets, patents, things that may not sound as bad, but are happening every day. These attacks drive up the cost of cybersecurity services because you have to have more robust firewalls and cybersecurity defenses in place, and they also drive the growth of cybersecurity insurance. The whole risk management and risk mitigation business take on a different definition as these attacks continue and become more pervasive and systemic. In that regard, these attacks help grow the cybersecurity industry.”

Industry Forecast

Thought Leader: Dave Skalon

Position: Chief Information Officer, Indiana National Guard

Area for Disruption: The adoption of a layered, Defense in Depth cybersecurity approach.

Professional Insight:

“Videoconferencing shows your body language and what you’re wearing. An application like Zoom or Teams is good for integration and flexibility but leaves you with vulnerabilities and is susceptible to hacking. If you can’t secure your meeting and can’t have a confidential meeting, you’ll lose confidence in everything. You have to constantly be aware of how you’re securing everything. In cybersecurity, you have to question “what is the intent of the hacker?” Your system may be under attack, so you unplug your machines to avoid further damage. But what if that was the intent? Maybe it wasn’t something on your machine they wanted access to, but now that you’ve gone offline, they have a clearer path to their original destination. You have to think about motivation and responses so you can effectively prepare. You have to ask the right questions. Do your security measures hamper operations or enhance operations? In relating this to an egg, you don’t just rely on a hard shell to protect a soft yolk.

You might build a fence 50 ft away, you might add a wall, then cameras. You have to consider the balance between what you can afford with the best you can come up with.”

Informational Resources

[What is a Cyber Threat?](#)

[SolarWinds Attack](#)

[The Cost of Cybercrime](#)



Biotechnology & Digital Medicine

1 What is it?

Biotechnology is the process of utilizing living organisms or parts of them to develop new products that can impact an array of industries. Biotechnology can be considered an umbrella term that encompasses an array of disciplines including genetics, molecular biology, and biochemistry. One space biotechnology is commonly associated with is healthcare and medicine. As it relates to medicine, biotechnology is primarily focused on opportunities to manipulate and change the DNA of organisms in efforts to prevent, cure, or learn more about diseases. Additionally, biotechnology is driving research to create drugs with stronger potency and fewer side effects. In the field of genetic research and testing, biotechnology is helping to minimize the chances that inheritable diseases are spread to children.

As biotechnology drives further innovation and opportunity, digital medicine is growing rapidly across all areas. Digital medicine is an area that focuses on using technologies as tools for supporting traditional healthcare. This is achieved by leveraging innovative hardware and software applications to support the practice of medicine and exist alongside pharmaceuticals and other medicinal products. Digital medicine has experienced an increase in potential due to the rise of interconnected technologies, IoT, and software as a service (SaaS) platforms [18].

2 How does it work?

Biotechnology enables scientists to make changes to organisms by working directly with the genetic material (DNA) of a cell. The base of biotechnology stems from breakthroughs in genetic engineering over the last century. As the structure of DNA became understood, genetic engineering took hold, which led to the rise in biotechnology and its applications in healthcare.

Biotechnology works by taking chromosomes composed of DNA and organizing them into sections called genes. With the understanding that genes control the production of proteins in a cell, and that proteins determine a cell's characteristics, one can quickly realize that by changing the DNA, the cell's characteristics will also change. By conducting this process, scientists can change the DNA of different cells and develop products, solutions, and cures in the process. Stem cell research and genetic engineering are paving the way for regenerative medicines that can clone or replace dead cells within the body. Genetic engineering is the most popular form of biotechnology, although there are a variety of other forms that are leading to advances in digital medicine [19].

Parts of biotechnology involve merging computer technology with biological information to create systems that can support the human body or other organisms. Nanotechnology is an example of an area of research being actively studied because of its potential to change the processes of medical practices such as surgeries. The last few months have created incredible strides in digital medicine, specifically regarding consumer-facing technologies. Remote medicine, including virtual and augmented reality, has impacted this space at an incredible scale. As remote services spiked throughout the last year, service providers and clinicians turned to new ways of leveraging technology to support their patients. If patients can be treated from home, there is a reduced cost and level of stress for all parties involved. Additionally, the personalization of healthcare that can be requested from the comfort of one's home is evolving. Digital solutions that are tailored specifically to certain patient populations will be the driving force behind both digital medicine and biotechnological applications.

From a data perspective, as patients are treated and supported by their medical provider, it is likely the data they collect will be uploaded to a central system. Systems like this are setting the stage for machine learning applications to leverage the data and make predictions on patients' health. Systems that will take the clinicians' bias out of the equation are being deployed in large healthcare centers, paving the way for the future of digital medicine.

3 Who's doing it?

The biotechnology industry is dominated by global, multi-billion dollar pharmaceutical companies including Vertex Pharmaceuticals and Gilead Sciences, both of whom became more well-known during the Covid-19 pandemic. On the digital medicine front, there are a variety of companies that are researching and building new medical technologies. Samsung, Accenture, Boston Scientific, and Abbot are leading the way as global contributors to the digital medicine industry.

From a stakeholder perspective, patients, caregivers, clinicians, and healthcare regulators are all heavily involved in the inception and creation of digital products in medicine. Clinical care providers are on the front lines of issuing biotechnology-related remedies to patients, while caregivers are being trained on best practices. On the other end of the spectrum, healthcare regulators are treading lightly due to the ethical boundaries being crossed as new digital medicine technologies are being implemented.

4 Why is it significant?

Biotechnology and digital medicine trends are focusing on preventing diseases instead of treating them. The state of healthcare was forever changed due to Covid-19, and the rapid growth that followed has led to innovation and investments in web and mobile experiences that have revolutionized the reality of digital medicine. 2020 saw the first-ever FDA-approved Prescribed Digital Therapeutics (PDTs), which are software programs that provide therapeutic interventions to help patients. This not only creates systems of more accessible treatments but provides an equitable approach to healthcare services and treatments.

With advances in telemedicine and digital care, patients can receive specialized treatment from their homes, which will have lasting impacts on everything from physical infrastructure to data security in the medical field [20].

Digital medicine technologies like augmented and virtual reality are widely used for treating trauma, mental disorders, and some phobias. In addition to patient-facing applications, AR and VR are being used by medical professionals to change the way medical topics and surgeries are conducted and to provide anatomical views of the human body. The biotechnology space is primed for opportunities to remove medication errors by utilizing big data. There is software that can provide an analysis of a patient's records to then prescribe the correct dose or prescription. Additionally, with machine learning and AI, predictive analysis can be conducted to offer specialized care to patients. Biotechnology and digital medicine are having incredible impacts on how the general population views everything from a doctor visit to receiving treatment.

5 What are the downsides?

Advances in biotechnology and digital medicine are creating breakthroughs that will forever change the world of medicine. They are also raising new ethical questions about the unintended consequences of new biotechnologies. There will undoubtedly need to be additional oversight to ensure that new technologies are carefully tested and analyzed before being publicly released. As new information is made available by the breakthroughs of biotechnology, ethical situations may arise that impact thousands of people. Biotechnology may soon allow medical professionals to identify a gene variant that will make people more susceptible to a certain disease. Does an insurance provider have the right to charge higher rates if they are aware of specific patient information? If an employer or educational institute had access to an individual's genome, could they make decisions based on it?

Privacy and non-discrimination factors are not the only concerns when discussing biotechnology and digital medicine. Advances in biotechnology can also create challenging dilemmas and complex scenarios for individuals who have certain tests conducted.

A person who undergoes genetic testing may find they are likely going to develop a deadly disease, or that their children will encounter significant health challenges later in their life. Having access to deeper knowledge doesn't make it easier to present bad news.

6 Where is it going?

The medical field experienced rapid innovation during the Covid-19 pandemic, which has led to investments in digital medicine that will outlive the negative effects of the virus that created them. Traditional aspects of the medical field are being virtualized rapidly, which requires digital adoption. Smartphones can be used as streamlining devices to decrease time spent registering for appointments, waiting in a doctor's office, or transferring prescriptions. . VR and AR technologies will continue to disrupt the medical space by removing the physical distance between professionals and provide new ways to approach old problems. Keeping patients out of hospital beds to be treated virtually can significantly reduce costs and increase convenience. Additionally, there will be an increase in at-home care for patients and a restructuring of what hospital care looks like. Telemedicine is the tip of the iceberg as it pertains to home care, as more clinics and healthcare providers offer new ways for patients to receive help remotely and virtually. Lastly, there will be a rise in the use and acceptance of prescribed digital therapeutics (PDTs), which are software programs that support therapeutic interventions with patients.

Industry Forecast

Thought Leader: Kathie Krusie

Position: Chief Administrative Officer, Community Health Network

Area for Disruption: Artificial Intelligence supporting the complexities of the changing healthcare landscape as it relates to generational care.

Professional Insight:

"Healthcare is getting so much more complex. I mean, doctors can't keep all this in their heads. It's impossible, and it's almost malpractice to try. So, we have to embrace [artificial intelligence], we have to look for those opportunities and not lose our humanity in the process because there's always that element of choice for patients. You can have patients with the same conditions and there's a range of choices and [clinicians] are going to make different choices based on their value system. We have to be able to create opportunities for our clinicians to be sensitive to that and to embrace that shared decision-making. I think there will be more people that say I want to take care of my health and I want to utilize [artificial intelligence] and I want my physician to be my partner, not the boss of my health."

Industry Forecast

Thought Leader: Dr. David Staley

Position: Associate Professor of History, Ohio State University

Area for Disruption: How the manufacturing of living things such as organs or agricultural products will have lasting geopolitical impacts.

Professional Insight:

"Biotechnology companies will have a geopolitical impact comparable to current big tech companies; university students will start gravitating more towards biology, chemistry, and agricultural studies instead of business or engineering". Dr. Staley goes on to iterate that "biotechnology will redefine the way we talk about technology and expand it to include biology."

Informational Resources

[Overview of BioTechnology](#)
[Digital Medicine Predictions](#)



IoT & Next-Gen Networks, Cloud

1 What is it?

IoT stands for “Internet of Things”, a network of almost anything that streams information. The device can be almost anything one can imagine: a thermometer, gauge, camera, motion sensor, pressure switch, motion detector – or any combination thereof. Individually, these devices are limited in what they can do. However, when connected to a network – such as the internet – their aggregated usefulness is exponentially greater.

Cloud computing is a way to deliver computing services through the internet (the cloud) to provide the opportunity for innovation and flexibility in computing services. These services are traditionally operated through physical locations and systems and continue to do so in some instances and organizations.

2 How does it work?

IoT devices work by collecting and streaming information while networked with other devices. Along the way, an ingestion engine monitors, collects, or stores that information. As these devices are on the internet, they can be almost anywhere and remain connected. Connectivity is no longer limited to the confines of a building or geographical area. One does not have to own the entirety of the network, as the internet is far more pervasive than a private network.

So, if an array of devices can connect to the internet and stream information that can be monitored or collected, this constitutes a powerful information tool that can be used to monitor what is occurring in real-time. It can be analyzed historically, reported on, and mined for trends. A huge number of points of view streaming data can be used from a faraway place connected to the internet.

A smart car, the lightbulbs in a home, the thermostat, the TV, the fan; all can become IoT devices.

3 Who's doing it?

Smart factories and industrial buildings are taking advantage of IoT devices, and this is expected to increase. They are finding new applications of devices that pair machines on the floor in smart warehouses, logistics, and storage. Aggregating real-time data into giant data stores is providing more insight into what is going on at any given time, improving the ability to make human and machine-based decisions. Some are using IoT sensors in addition to other monitoring tools, generating tons of data – this helps maintenance personnel identify and predict problems before they occur.

One interesting case is a retail store named “Bingo-Box” in China. It is a 24 hour, cashier-free convenience store. They use QR codes as customers enter the store, then sensors and computer vision technology to track shoppers and the items they are picking up. There are no staff members at check out either. Shoppers scan their items and pay for them with apps on their phones. Facial recognition is used as a security feature to track them as they leave the store with their purchases. China’s attitudes are favorable towards some AI-based, IoT retail.

More than half of consumers are happy to pay using biometric identification, prefer self-checkout, and would consider a smart refrigerator that automatically orders and replenishes items. A healthy 41% like shopping at unmanned stores [21]. In the United States, Amazon Go is similar to Bingo Box in China. Like Bingo Box, Amazon Go favors computer vision technology and sensors. Cameras work with sensors on store shelves to collect data about customer buying habits.

4 Why is it significant?

IoT devices are increasingly becoming part of the cloud network. This is significant because it will be a major consideration in companies' cloud strategy. These devices enable distributed cloud capabilities. The ability to operate anywhere with a distributed cloud provides a company with significant agility and frees them from the confines of one geographical area. It allows them to put their network anywhere over the internet.

5 What are the downsides?

One downside to the exploding IoT space is the vulnerabilities exposed by the lack of standards around device security. This threatens the expansion of services related to IoT devices. IoT device security is a new paradigm, different from traditional network-based attacks. Standard tools familiar to established IT security managers need to be rethought – firewalls and intrusion detection, for instance. A new approach must be taken with new AI models. Furthermore, these devices are easier to hack and turn into bots, creating large botnets that can further be used to attack. There is a long road ahead of working through markets to define standards, overcome integration challenges, and adopt an ROI-driven approach going forward.

Another challenge is that IoT cyberattack targets are not the traditional targets like banking, enterprise, or finance. Instead, the new targets of more frequent attacks are industries like smart cities, smart health-care, surveillance systems, connected infrastructure, connected transportation, automotive telematics, monitoring devices, or industrial and processing facilities. These industries may not be prepared to mitigate coordinated cyberattacks, let alone dealing with them more on a consistent basis [22].

One perceived downside to the influx of IoT networks, particularly in retail, is the loss of jobs. Although it hasn't come to fruition on the 2019 timeline predicted, some researchers think that the U.S. government could begin implementing robotic-specific regulations to preserve jobs. Nonetheless, researchers believe these advances will lead to far more jobs created than lost [23].

6 Where is it going?

There is a vast future for IoT in retail. Many believe that cashier-less technology will be the future of traditional, brick-and-mortar stores. Some also believe that it could get rid of self-checkout kiosks. The future is called “walkout shopping”, which saves time and money for the customer and the store. This gets rid of lines, checkouts, and other hassles. The future isn't just disrupting grocery shopping, it's reinventing retail entirely. The human element will still be important in retail, as it always has, but it will shift from the transaction to the experiential. For enterprises, IoT devices enable companies to have greater reach with their networked components, anywhere the internet reaches. It enables operations to happen anywhere with a distributed cloud, spread over the internet instead of privately managed networks.

Industry Forecast

Thought Leader: George Riemer

Position: Enterprise Account Manager, Hewlett Packard Enterprise

Area for Disruption: On-premise consumption-as-a-service models decreasing dependence on cloud service providers and increasing customer autonomy.

Professional Insight:

“Not everything will go to the cloud. Some things will, some things won't. I think the new cloud, the disruptor of the cloud, is going to be consumption-as-a-service. Taking actual, physical assets and dropping them in a customer's data center and charging them like the cloud. So cloud-scale economics, but on-premises. Therefore, you're still only paying for what you're using, but you have greater security, greater control, and greater flexibility; should you ever decide to go to a different provider, it's so much easier.”

Industry Forecast

Thought Leader: Dr. David Staley

Position: Associate Professor of History,
Ohio State University

Area for Disruption: The proliferation
of IoT devices in the workplace.

Professional Insight:

“Lots and lots of things will be communication devices or will be in communication with each other, not just in our homes, but in our workplaces. IoT devices can have a range of implications but will become increasingly widespread, especially in the wake of the pandemic. This could experience pushback if it is perceived as an extension of the surveillance society, but has uses from assisting in simple tasks like a grocery list to helping enable autonomous manufacturing.”

Informational Resources

[The Future of IoT](#)
[IoT Applications](#)



Automation & Robotics

1 What is it?

Automation is the use of equipment or software to eliminate human labor in a process. This may be accomplished through software or with equipment, including robots.

“Automation takes a lot of forms,” according to Furtrieve CEO Jordan Hetlund. “For small businesses, it is most commonly used to eliminate repetitive processes in software or lightweight manufacturing. When you find a definable process that you do repeatedly that adds value, this is a prime target for automation.” Nearly all businesses are currently using some level of automation across service and manufacturing sectors.

Specific to IT, automation is the use of software or routines within the software, to create repeatable instructions and processes to eliminate or reduce interaction with systems, reducing costs and improving response times. Three factors are now driving the rapid proliferation of IT automation. First, cloud services are now making the resources required for automation access accessible to small and mid-size businesses. Second, new development tools now allow the creation and implementation of automation processes with a much lower level of technical expertise. Finally, the integration of machine learning and artificial intelligence into IT automation software and systems is exponentially expanding the number of use cases and the value of implementing automation. Automation has become key to IT optimization and digital transformation. Modern, dynamic IT environments need to be able to scale faster than ever and IT automation is vital to making that happen.

Across work, this is the era of organizational enterprise automation: intelligent automation scaled and applied across the enterprise. As organizations deploy intelligent automation for more advanced work, the landscape is shifting, with intelligent machines’ tasks expanding from administrative to

include more cross-enterprise and expert work.

A similar scenario is occurring with robotics. These technologies are evolving quickly, and there are now 2.7 million industrial robots (manufacturing) and more than 1 million professional service robots (think robots in car washes and other non-industrial settings) in use globally. Consumer robots are also rapidly expanding. These trends are driven by the rapid evolution of these devices, which as with IT automation, is exponentially expanding their use and driving down costs.

2 How does it work?

The basic principle of automation is simple: implement a device or program in a process to eliminate or reduce the amount of human labor. Introducing a robot in a manufacturing or service process to eliminate a human step is easy to visualize. IT automation in software can be more abstract. With IT automation, a program is used to automate a task, such as provisioning a server, configuring a router, or elevating a service request to a live agent.

Current automation trends include the use of artificial intelligence and machine learning to create adaptive processes to manage unpredictable situations and real-time interactions. These technologies are still at an early stage of development, but they are already transforming many processes. As tools advance and become more responsive, they will incorporate real-time learning and improvement. Similarly, the tools to develop and implement automation are becoming more advanced and powerful, simultaneously reducing the technical skill and time required for development and allowing more rapid creation of automated processes and workflows.

3 Who's doing it?

From automotive manufacturing to construction, from foodservice to healthcare, automation and robotics are now in wide use across all sectors

4 Why is it significant?

AI-enabled automation and robotics are the future. In just three years, the nature of machine work will change dramatically, with both the percentage of tasks and the level of their complexity growing. Intelligent automation will optimize business process workflows. We will be able to generate higher revenues while controlling costs. Organizations can build a more flexible workforce by striking the right balance between human and digital labor.

As a recent IBM report indicates, the nature of machine work is changing rapidly. The percentage of tasks overall—administrative, departmental, and cross-enterprise, and expert—will continue to grow substantially, with the largest percentage increase in cross-enterprise and expert work. Breaking that down further, one in five respondents report that machines will perform cross-enterprise transactions across multiple departments, and 5 percent say machines will perform expert work—problem-solving based on real-time information or multiple inputs. Today, the most common uses reported by executives include automating administrative and departmental work. In three years, 26% of projects implementing AI-enabled automation across expert areas of work within their organizations [24].

5 What are the downsides?

Automation and robotics will drive significant job elimination over the coming decades, and the focus of this elimination will shift to white-collar and expert roles. A recent McKinsey analysis of 2,000 work activities across 800 occupations found that businesses project that almost half of those activities will be automated by 2030. This represents the automation of work for which workers were paid nearly \$16 trillion across the global economy.

Following McKinsey's analysis, firms project that, while less than 5 percent of all occupations can be fully automated using current technologies, about 60 percent of all occupations include at least 30% of their focus on elements that can be automated. Thus, many more occupations will be altered than will be eliminated by automation. The combined effect of automation will be the elimination of some roles, a reduction in employment across many roles, and an alteration of most roles in some way.

The activities most susceptible to automation involve physical activities in highly structured and predictable environments, as well as the collection and processing of data. In the United States, these activities make up 51 percent of activities in the economy accounting for almost \$2.7 trillion in wages. They are most prevalent in manufacturing, accommodation and food service, and retail trade, including some middle-skill jobs. Technical, economic, and social factors will determine the pace and extent of automation. Continued technical progress, for example in areas such as natural language processing, is a key factor. Beyond technical feasibility, many factors will affect the pace and scope of automation, including costs, labor skill and availability, performance benefits such as reduced labor costs, and social and regulatory acceptance [25].

The broad proliferation of automation will also exponentially increase human reliance on technologies. As the number of robots and automated processes and systems multiply, points of attack and vulnerability will follow. This will almost certainly lead to increased attacks by state-level actors, corporate actors, and individuals. This means exponentially heightened security risk and dependency. The precise consequences cannot be projected, but the range of negative impacts will be wide and demand research and investment.

McKinsey, and our survey respondents, predict that half of today's work activities could be automated by 2055, but this could happen 20 years earlier or later depending on many factors. For business, the performance and profitability benefits of automation are clear. For society and policy-makers, the disruptions, security risks, and other downsides must be considered and addressed. The breadth of automation impact will demand new training, transition and safety net programs, and cybersecurity initiatives.

Works will need focused preparation in working with machines and in skills to reinforce distinctive human capacities. These will demand new approaches to education at the K-12 and higher education levels.

Informational Resources

[Future of Automation](#)

[Future of Work](#)

6 Where is it going?

Industry experts all agreed that automation and robotics are at an inflection point in adoption and will see rapid expansion over the coming decade. Jordan Hetlund, of Furtrieve, captured the common perception in noting that “nearly all industry and most jobs will be widely and deeply impacted by automation and robotics. Many aspects of human work will be made less tedious and less dangerous. Many new roles working technology and in support of these new technologies will be created. Industry and sector productivity and profitability, holding other variables constant, will rise. But, the costs of these advances could be high. There will be many jobs eliminated and many more redefined. This will create high-order disruption and anxiety in many areas, and this will be especially concentrated in some communities. The balance of social benefit and costs is difficult to calculate, but the trendline is unavoidable. Whether they are created first in the US or elsewhere, their future adoption is certain, and the companies and countries that get their first will have significant global advantages. And, these advantages likely outweigh the costs.”

Industry Forecast

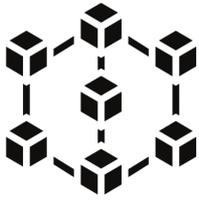
Thought Leader: Jeremy Cekan

Position: CEO, Black Ash Technologies

Area for Disruption: Marketing and sales processes across all sectors.

Professional Insight:

“Driven by advances in artificial intelligence, market analysis will be increasingly conducted by engagement software employing AI and ML to identify likely purchases (whether businesses or consumers). This is already happening at scale in many firms. Over the coming decade, this will increasingly involve using workflows to guide the efforts of sales teams and where possible replace human labor with sales bots that directly interact with businesses and individuals to procure orders.”



Blockchain, Encryption & Digital Currencies

1 What is it?

Blockchains, also known as distributed ledger technologies, are super-secure methods of storing, authenticating, and protecting data and could revolutionize many aspects of a business – particularly when it comes to facilitating trusted transactions. Simply put, a blockchain is a database that is nearly impervious to deletion, tampering, and revision.

2 How does it work?

Blockchains work by using peer-to-peer networks to store data on thousands of servers versus one central database. Blockchain stores data onto ‘blocks’ that are linked to previously filled blocks, forming a digital chain of data, hence ‘blockchain.’ Each new data entry is compiled in a newly formed block in sequential order and given a timestamp, creating an unalterable timeline of all data entry.

What gives blockchains so much potential is their decentralization, immutability, and transparency. Decentralized blockchains are processed using non-owned, geographically separated computers known as nodes. Private, centralized blockchains operated by a single entity also exist, but decentralized blockchains give power and access to innumerable users and stakeholders. Both central and decentralized blockchains have a full record of data stored on that specific blockchain since inception. If one node has an error in its data, it can use thousands of other in-chain nodes as a reference point to correct itself. This way, no one node within the network can alter information. To change any data within a node, a majority of the network’s computers or devices would need to agree on said changes. This makes data loss and tampering nearly impossible.

All transactions can be transparently viewed on decentralized blockchains using a personal node

or a blockchain explorer program that allows anyone to see transactions occurring live. In the world of decentralized blockchains, every tracked process, task, and data point has a digital record and signature that can be identified, validated, stored, viewed, and shared.

3 Who’s doing it?

Supply chain resilience is growing in importance. Whether mandated or incentivized by governments, shareholders, or consumers, businesses face pressure to ‘own’ supply chains and have visibility into all partners to create maximum efficiency. Several factors, the primary being climate change, present immense disruption to future logistics, manufacturing, and transportation.

One macrocosm of supply chains where blockchain is emerging is food distribution. Walmart created a food traceability system based on the open-source, decentralized blockchain called Hyperledger Fabric. Walmart’s business goals were specific and two-pronged: trace mangos sold in US stores and trace pork sold in China’s stores. The blockchain functioned by issuing certificates, or smart contracts, to suppliers at each product hand-off. To ‘earn’ the certificate, suppliers had to meet requirements and upload product data through a web-based interface, which was then stored on the blockchain and verified for authenticity. This process allowed the company to reduce food tracing from seven days to 2.2 seconds.

Walmart now traces over 25 products from five different suppliers using blockchain. It plans to scale to more products and categories. Its success sparked it to partner with IBM’s Food Trust, which joins food retailers – such as Unilever and Nestle – to unite suppliers and sellers under one shared blockchain.

Finance is an industry built on transactions and records that face fraud, theft, and other abuse. Blockchain represents a hugely foundational and disruptive force to the world of finance. The potential to reduce risk is not lost to traders and investment executives – the finance sector is also an early adopter of the technology. Applications are vast, but one specific project used blockchain to process credit applications faster and detect fraud easier across a consortium of banks, detailed in the 2020 Singapore Blockchain Ecosystem Report. A trade finance network, Contour, is based in Asia and comprises eight partnering banks – Bangkok Bank, BNP Paribas, CTBC, HSBC, ING, Standard Chartered, and SEB. It works with financial institutions to put letters of credit on a blockchain accessible between organizations, which makes verification much quicker and easier. It uses the same approach to track credit for organizations in the mining value chain. The blockchain provides access to real-time status updates at each step of the credit transaction and reduces manual credit processing times by 90 percent. What used to take the various organizations five to 10 days can now be done in under 24 hours.

4 Why is it significant?

Often viewed for its consumer applications, blockchain has been relegated to currency arbitrage and non-fungible tokens in the court of public opinion. In business, the use is nascent yet tremendous. As explained by professors Marco Iansiti and Karim R. Lakhani in the Harvard Business Review: “Blockchain is not a disruptive technology, which can attack a traditional business model with a lower-cost solution and overtake incumbent firms quickly. Blockchain is a foundational technology: It has the potential to create new foundations for our economic and social systems [26].”

All organizations keep records (a contract, receipt, certificate, etc.) of transactions. The same logic applies to transactions – it is a handoff from one party to another. Yet, organizations have no master tracker of all their activities. Reconciling transactions across partners and functions – both internally and externally – is burdensome and error-prone. With blockchain as a source of record for all data, firms can track all records and transactions quickly, securely, and verifiably.

At its most ambitious and conceptual level, a blockchain can track past actions and performance and guide planning for the future. Deloitte’s Global Blockchain Survey found that 82 percent of respondents will staff up on blockchain experts in the next year or plan to do so, compared to 73 percent in 2019. Larger companies, those with \$100M-plus revenue, are more considerate with 89 percent planning to hire [27].

Where blockchain sees its biggest potential is solving accountability challenges. Its applications have a broad scope across cybersecurity, accounting, source of record, and finance. But its most nascent, interesting applications will be in supply chains and finance.

5 What are the downsides?

Blockchain’s proof of concept is true and apparent, but proof of profit is few and far between. Blockchain is a very new technology, first theorized in 1991 and implemented in 2008. As a foundational technology and data platform, decentralized blockchains require vast amounts of user devices, or nodes, to generate value. In Gartner’s blockchain survey, blockchain adoption is reticent in the U.S. with only 39 percent planning projects within the next year [28].

It is also a grandiose technology requiring consent from other organizations and skilled technical implementation. With transparency comes accountability and some partners may not want the visibility that comes with it. As supply chains become fragmented with buyers diversifying product sources, purchasing companies may have less power to influence suppliers. Most U.S. businesses are small or midsize and not in high-tech geographic corridors. This makes skilled staff hard to obtain and presents a large barrier to implementation.

6 Where is it going?

The pendulum could swing. Large firms could choose to only partner with blockchain-enabled companies. This downward pressure and increase in demand could create blockchain skills rush, similar to that of programmers in the dot-com era.

There are many consortiums, alliances, and organizations working to productize blockchain, standardize applications, and build confidence in its systems. Consortia also have non-commercial strategies in play – grow the talent pool, support collaborations between academia and industry, and simplify the technology to address common pain points. As the technology continues to grow, expect to see its diffusion sector-by-sector, firm-by-firm over the next decade.

Industry Forecast

Thought Leader: Pepito (JoJo) Baldeo, Jr.

Position: Director of Architecture, Global Team, Limitless Connect

Area for Disruption: Blockchain and a unified currency impacting financial transactions

Professional Insight:

“We need lawyers to be witnesses to our contracts. We need to notarize contracts and the way we relate to other businesses. I think we might not need lawyers with blockchain. It will not only affect money, it will also affect how we verify things, how we authenticate things, how we authenticate contracts, how we authenticate the suppliers. If I have a good blockchain system link to my suppliers, I may not need to work on contracts with them. These contracts may not need to be notarized by lawyers or require the hiring of legal companies to verify the VCP of documents. Blockchain could help with authenticating this data. Through the globalization of a unified currency, like Bitcoin, it will diminish the control of the bureaucratic big banks that have control over the flow of money from one country to another.”

Informational Resources

[Blockchain Basics](#)

[Cryptocurrency Defined](#)



Massive Computational Power

1 What is it?

Computing power is one of the three key factors that drive the advance of artificial intelligence (AI). The other two factors, data, and algorithms, generally have a stronger and more widespread association with AI innovation. Data is the input that fuels and informs AI, while algorithms are the complex functions that allow AI systems to understand and learn from data. Computing power, also referred to as compute, provides the critical processing capabilities that enable AI systems to perform staggering amounts of calculations at high speeds. The input and learning processes of AI algorithms and data can require trillions, and even quadrillions, of calculations per second. Without processors providing the compute necessary for these titanic calculations, AI systems can't function. Computing power is the workhorse that makes AI possible.

In the past decade, the speed and reach of AI capabilities have exploded. The rapid expansion of AI abilities has been significantly expedited by the unprecedented growth of computational power. Moore's law popularly theorizes that as engineering continues to improve, the basic compute power of computer chips (the building blocks of compute) will double every 24 months. In comparison, between 2012 and 2018, the amount of compute used in the largest AI training projects doubled every 3.4 months. It is difficult to overstate the magnitude of this exponential increase in computing power, and industry analysis foresees this pattern continuing. As an established trend, the continued growth of computing power means that AI systems will correspondingly grow faster, more powerful, and more efficiently. As computing power continues to surge, the correlated areas of AI, machine learning, automation, big data, and other facets of technology will be significantly impacted. In turn, this growth will amplify the influence and roles that these technologies have on management, leadership, and business models.

2 How does it work?

The doubling of computational power in Moore's law is predicated on continually increasing the number of transistors and other processing components in computer chips, or semiconductors. While innovations in processor engineering have indeed contributed to the massive growth of computing power, the recent boom in compute is also due to progress in the process of parallelization, in which multiple computer chips simultaneously train (facilitate the learning of) AI systems. In addition, computer chips have become more efficient and customizable for specific AI tasks. Hardware advances in processor engineering, parallelization, and computer chip efficiency, and customizability have played key roles in boosting AI computing power. Another key enabler of these advances is the software used to design these computer chips.

3 Who's doing it?

The strategic, economic, and national security implications of AI advances and superiority have created an incredibly competitive environment for research, development, and innovation in the area of computational power. The U.S. chip-manufacturing industry is the world's leading provider of computer chips; together, Japan, the Netherlands, and the U.S. control more than 90% of the global market share of chip-manufacturing equipment. In addition to chip-manufacturing equipment, the U.S., Japan, and Taiwan are host to the world's leading chip fabrication facilities. In particular, Taiwan is home to Taiwan Semiconductor Manufacturing Company (TSMC), the world's largest contract producer of semiconductors.

China is also a significant AI competitor, but while it competes globally in the areas of data and algorithms, it continues to lag in its computational power capabilities.

Beijing's domestic chip industry has historically suffered from a lack of experience, technological shortcomings, and failed strategies. However, the Chinese government has taken measures to close the computational power gap. In 2014, China established the China National Integrated Circuit Industry Investment Fund to invest in its domestic chip industry. Even as China strives to create computer chip independence, it continues to rely largely on Western software and computer chip imports.

The prohibitive costs of chip-manufacturing equipment and fabrication are a significant barrier to research and innovation in these areas. AI research laboratories like OpenAI and DeepMind are leading organizations at the forefront of computational power application, while industrial giants like TSMC, Samsung, Intel, Nvidia, and Qualcomm provide the infrastructure and innovation that continue to push the limits of compute. Start-ups and other small businesses lack the resources and capabilities of chip-making giants, but AI and chip-focused start-ups are also making waves in Silicon Valley. Backed by significant venture capital, creative entrepreneurs are seeking to disrupt the processes of chip design, algorithm development, and AI specialization.

4 Why is it significant?

Advances in computational power are most significant because of their impact on AI. Increasingly, AI primacy has dominated conversations of geopolitical, economic, and military capabilities. As nations pursue AI through the lens of international competition, AI systems continue to expand and revolutionize emerging technologies in the public and private sectors. Smart cities, autonomous vehicles, facial recognition software, virtual reality, automation, and database systems are all leading areas of AI application. These technologies are actively changing the way humans think, work, and live; as computational power grows, it expands the capabilities of AI, accelerates technology trends today, and draws us closer to the possibilities of tomorrow.

5 What are the downsides?

The extreme cost of chip-manufacturing equipment and facilities is the most daunting obstacle to computational power advances. New facilities can cost tens of billions of dollars, and the chip-making machines themselves can cost more than \$100 million each. These prohibitive costs serve as significant barriers to academic researchers, start-ups, and other less-than-massive companies that could otherwise be innovating and contributing to the progress of compute technology and AI development.

6 Where is it going?

Global security trends and U.S. national security priorities strongly indicate that AI and, by association, computational power, will increasingly occupy a more important role in economic and defense policies. In 2018, the Trump administration successfully persuaded the Netherlands to block a chip-manufacturing machine export to China to maintain the U.S. strategic advantage in chip production. As China continues to distinguish itself as an eminent U.S. adversary in economic, political, and military spheres, it is unlikely that the power struggle for AI and compute dominance will subside. China's chip-focused national fund will maintain efforts to challenge U.S. chip-manufacturing hegemony, while the U.S. will be forced to assess how it can manage and reduce the financial barriers to computational power innovation to maintain its competitive edge. The industry titans will continue to dominate chip production, but the infusion of start-up efforts in chip design offers exciting possibilities for collaboration involving large-company resources and small-company innovation.

unheard of using conventional means.”

Informational Resources

[AI & Microchips](#)

[AI & Compute](#)

[Compute and Great Power Competition](#)

Industry Forecast

Thought Leader: Dave Hazen

Position: President and Owner, Sound Ideas

Area for Disruption: Compute-powered AI and Machine Learning capabilities that will redefine workforce knowledge and skill requirements across industries.

Professional Insight:

“Computing power has progressed to the point of virtually instantaneous processing of huge chunks of data used for analytics, decision-making, innovation, marketing, etc. AI and Machine Learning will continue to be a double-edged sword that drives down costs & increases speed and efficiency for businesses, but will disrupt and, in many cases, replace what might be considered ‘traditional’ workforce skillsets, requiring a new age of knowledge workers to fill the gaps in markets.”

Industry Forecast

Thought Leader: Dr. Thyra Rauch

Position: UX Research Consultant, uX-experience Group

Area for Disruption: Quantum computing power that can solve intractable computation problems and process unstructured data into usable information.

Professional Insight:

“Quantum computing has the potential to be the most significant disruptor over the next 10 years. There are computation problems above a certain size and complexity that we don’t have enough computational power on Earth to tackle. The ability to solve these problems requires a different kind of computing. Universal quantum computers leverage the quantum mechanical phenomena at the quantum level to create the power and ability to solve those seemingly insurmountable problems. Applied widely across the IT industry, the potential for process Understanding trends and directions by turning unstructured data into usable information for marketing and trending would push business to levels

THE CICS 2021 HORIZON REPORT:

MANAGEMENT AND LEADERSHIP TRENDS THAT WILL SHAPE THE NEXT DECADE

Dr. Dennis A. Trinkle

Cyrus Green, Christopher Nouhan, Paul Faria

**Center for Information and
Communication Sciences**



**BALL STATE
UNIVERSITY**

Center for Information and
Communication Sciences

An Introduction - Future Disruption

The Covid Pandemic has upended many technology, business, and leadership trends while accelerating and adding new urgency to others. The interplay of this disruption and acceleration is highly evident in the 2021 Horizon Report. To capture and represent this dynamic environment, this year's report takes both a wide-angle and telescopic approach to identifying the major trends in technology, business practices, and leadership practices that will drive and reshape organizations over the coming decade. Through detailed surveys, interviews, and supporting research the Center for Information and Communication Sciences research team looked at current significant trends across all sectors, zooming in to look at current states, zooming out to look at developments anticipated to emerge further out on the time horizon, and widening the long-term lens to identify and describe the synergistic effect the individual trends will have in varied combination. What we discovered is an unprecedentedly rich period of innovation across all sectors and categories. While it is difficult to anticipate clearly the ultimate outcomes of the trends identified here, we hope the trends and direction arrows identified below will help organizational leaders at all levels to better anticipate, plan, build and innovate.

Methodology

To identify the key trends identified in the Horizon Report, the research team relied upon expert surveys with more than 100 thought-leaders and top executives across diverse corporate, government, and non-profit sectors. Over 50 thought leaders participated in detailed interviews and follow-up conversations to add breadth, depth, and nuance to the analysis. These expert forecasts were supplemented with research across current literature and findings from related studies. The results represented here are based on this combined research and reflect the input of the many experts who contributed to the analysis. We are grateful to each of them for sharing their time, experience, and expertise.



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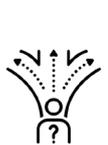
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Need for Emotionally Intelligent Leaders

1 What is it?

Emotional intelligence (EQ), in the simplest terms, is understanding and managing emotions. It is the “ability to manage ourselves and take other people’s perspectives into account while not being blinded by what we are feeling at the moment [29].” These can be your emotions or the emotions of others. When looking at how emotional intelligence relates to business, consider what emotions are used when deciding to buy something, beginning a relationship, accepting a new job, and many other critical components of a business. While data can be valuable, we need to have emotional intelligence when dealing with people.

There are many studies that show how emotional intelligence can predict job performance and leadership potential. Emotional intelligence accounts for 58% of success in jobs from different industries. This is because emotional intelligence can build skills such as stress tolerance, social interactions, presentation, customer service, trust, and much more. Also, individuals with a higher emotional intelligence make an average of \$29,000 more per year [30]. This applies to all people in different industries and different areas of the world. Overall, performance is improved greatly with emotional intelligence.

2 How does it work?

Developing a strong foundation in emotional intelligence requires an understanding and practice of each of its components. The discipline of emotional intelligence comprises self-awareness, self-management, social awareness, and relationship management. Each component constitutes an equally important aspect of understanding and managing the emotions of yourself and others.

A large part of emotional intelligence is building

self-awareness. However, understand that self-awareness is not simply being one with yourself or understanding your personality. It is also not something logical that you can explain via self-assessments or analyzing how others think of you. Self-awareness is being aware of how you react in a specific situation. People are often not aware of the full extent of their reactions. We know our emotions in simple terms, such as being sad, happy, and so on, but it is important to understand our emotions on a deeper level; we need to be able to recognize them as they happen and know what influences them.

A component of emotional intelligence that connects with self-awareness is self-management. With good self-management, you are not only aware of the emotions you are feeling at a given time, you are actually able to manage and control them. As a leader, you will face many situations when something goes wrong on a project or a deal falls through and you want to react in a way you know is too extreme. Self-management is understanding how you feel, but deciding to show your emotions in a different manner. This does not mean you hide or push down how you feel to avoid conflict; it is not a good idea to turn off your emotions, since they are connected with you as an individual. It is important that you be honest with yourself about how you feel, but alter your response to best fit the situation.

Similar to self-awareness, social awareness (also referred to as empathy) is being able to understand and identify with the emotions of others. This helps you understand the people around you. Being self-aware also promotes social awareness, because people see that you are more open and vulnerable, but also more empathetic. This allows them to feel comfortable showing their emotions. Allowing yourself to connect with others on an emotional level promotes trust. You will now understand what your clients and coworkers are feeling. Once you understand how they feel, you can alter your interactions with them

to best suit the situation. Just as self-management is tied to self-awareness, relationship management is tied to social awareness. It involves building relationships and learning to properly manage them. While a high emotional intelligence will be helpful with relationships, there is a level of conscious work required to manage relationships properly. Communication is still a large part of building relationships, and it requires active effort to talk to others. You need to be curious about people and what makes them tick.

3 Who's doing it?

Many leaders understand the importance of fostering a culture where emotional intelligence is a priority and a practice. As more value is placed on a human-centric workplace, leaders are changing the way they approach hiring, onboarding, marketing, and internal development. Indra Nooyi, CEO of PepsiCo said “you need to look at the employee and say, ‘I value you as a person. I know that you have a life beyond PepsiCo., and I’m going to respect you for your entire life, not just treat you as employee number 4,567 [31].’” Industry leaders have recognized that if they create a culture that emphasizes emotional intelligence, where employees can be people first and workers second, more professionals will not only come work for them, but they will stay.

For example, when there were claims of higher than average injury rates at a Tesla factory, CEO Elon Musk responded with “No words can express how much I care about your safety and well-being. It breaks my heart when someone is injured building cars and trying their best to make Tesla successful. Going forward, I’ve asked that every injury be reported directly to me, without exception. I’m meeting with the safety team every week and would like to meet every injured person as soon as they are well so that I can understand from them exactly what we need to do to make it better. I will then go down to the production line and perform the same task that they perform. This is what all managers at Tesla should do as a matter of course. At Tesla, we lead from the front line, not from some safe and comfortable ivory tower. Managers must always put their team’s safety above their own [32].” Leaders like Nooyi and Musk are driving change by using their position of power, authority, and influence to make their companies stronger and their employees feel heard.

Microsoft CEO Satya Nadella showed his employees that he was there to support them and help them grow, even in a horrible PR situation. When a Microsoft AI and Twitter bot, Tay, became racist and profane on the platform after launch, Nadella responded to the project team in charge of the bot with “Keep pushing, and know that I am with you... (The) key is to keep learning and improving.” He later iterated that “if people are doing things out of fear, it’s hard or impossible to actually drive any innovation [33].” There is incredible value in leading through an empathic and emotionally intelligent lens. These organizations are at the forefront of change and are leading the way for emotionally intelligent workplaces across industries.

4 Why is it significant?

Emotional Intelligence is a valuable skill that every leader should possess, especially as they face unprecedented challenges due to the fallout of Covid-19, racial inequality, economic and social uncertainty, and an array of global issues. Having a high EQ is integral to high performance and ultimately the success of their businesses. In challenging times where navigating a traditional environment is difficult, the ability for leadership to analyze, empathize and be human is critical. Research conducted by Daniel Goleman found that 80-90% of top performers in the C-Suite are distinguishable by high emotional intelligence [34]. How a leader handles themselves, approaches relationships, and performs when working with teams is critical to not only their success, but the success of the business they are leading.

Research firm Egon Zehnder International found that high emotional intelligence was a strong predictor of success “when the appointees excelled in experience and IQ but had low emotional intelligence, their failure rate was as high as 25% [35].” This finding contrasts starkly with a 3-4% failure rate in employees with high emotional intelligence. Furthermore, employees who lacked EQ entirely were the most likely to leave or be fired from the business. There is significant value to leading with emotional intelligence, as this can make the difference between a strong company and a failing enterprise.

5 What are the downsides?

As more businesses recognize the value in treating employees like people and with human-centric expectations, the companies that ignore these trends will likely experience lower onboarding rates and higher turnover. The organizations that restructure their traditional culture to appeal to a multi-generational workforce will have the opportunity to choose the strongest talent and escalate their business to the next level. Additionally, emotional intelligence is a learned skill that takes time and practice. It is not something that can be triggered overnight. Businesses will need to allocate necessary resources and invest into training for their teams at all levels of the organization.

6 Where is it going?

As the workforce continues to shift focus on the employee experience rather than the needs of the employer, businesses must show that they care about their teams at a human level, one where emotional intelligence is a core expectation. According to a study by the Limeade Institute, employees who feel cared for by their organization are [36]:

- 10 times more likely to recommend their company as a great place to work.
- 9 times more likely to stay at their company for three or more years.
- 7 times more likely to feel included at work.
- 4 times less likely to suffer from stress and burn-out.
- 2 times as likely to be engaged at work.

Businesses will continue to adjust their hiring, training, and onboarding processes to be more inclusive, engaging, and human-centric in design. As technological innovation continues to drive changes like hybrid and remote workspaces, emotional intelligence will be more valuable as teams collaborate and connect virtually. We expect that the relationship an employer has with their employees will expand and evolve to new boundaries where businesses will have to supply additional benefits to their teams. From a generational workforce lens, Gen Z “wants their managers to be empathetic” more than any other

generation, according to The Center for Generational Kinetics 2020 study [37]. The future of work is rooted in high self-awareness, strong empathy, and habitual emotional intelligence.

Industry Forecast

Thought Leader: Jennifer Merrel

Position: Senior Relationships Manager, TechPoint

Area for Disruption: The rise of servant leadership and the value of empathy in leaders.

Professional Insight:

“When I look at phrases like ‘servant leadership,’ I can’t help but think of ‘The Dream Manager’ by Matthew Kelly. Not every company needs to have a Dream Manager or even Dream Manager level programs. But those companies that are able to help their employees achieve their dreams alongside the company goals will emerge as winners both in talent attraction and retention but in loyalty, trust and production from their employees. Supporting the talent retention and attraction challenge that is key to the success of every organization in every industry and in sync with empathy emerging as a key leadership differentiator >> when folks feel cared for, supported, understood, and encouraged, loyalty and production will not be an issue.

Most organizations (and I mean leaders) can’t get out of their own way - they can’t stop thinking about their own ambitions (for themselves and their orgs) long enough to realize they could be the answer to many of the challenges holding them back. The impact is winning the talent game and subsequently the production and success game for an organization.

The shift in genuine mindset is the hardest to overcome. It can’t be a system that is bought into and forced upon the masses like a project plan. It has to be genuine. The employees will see right through it otherwise. Those leaders who have matured emotionally, done self reflection and truly want to be more themselves will be the ones that emerge. It will be a subtle shift in this company or that company and people will wonder how they achieved such great success; why talent is lining up to work there; and how this leader has achieved the care and loyalty back from employees.”

Industry Forecast

Thought Leader: Todd Smith

Position: Co-Founder, Owner and CPO, Joy Organics

Area for Disruption: The days of the dictatorial type of leadership are over

Professional Insight:

“I think people want to feel valued. People want to know that their opinions matter. They want to be listened to. They want to be contributors, they want to be respected. They don’t want to just be an employee who’s told what to do. I think that the days of dictatorial leadership, where you lead with your title or your rank or because you have authority are changing to be more of a 360 leader. John Maxwell says leadership is “one word influence”. Well, how do you become a person of influence? It’s two words: you’re respected and you’re liked.”

Informational Resources

[Emotionally Intelligent CEOs](#)

[Risks of Ignoring EQ](#)

[Emotional Intelligence and the C-Suite](#)



Shifts in Workforce Demographics

1 What is it?

The world is changing at an unprecedented rate. Continuous advances in technology, globalization, social norms, and work expectations are having a significant impact on workforce demographics. Paired with rapid technological innovation and increased longevity, aging populations and workforces across the globe, have led to complex challenges for policymakers and employers alike. For the first time in history, there are five generations in the workforce that have various motivations, expectations and worldviews. The five generations are [38]:

- Traditionalists - born 1925 to 1945
- Baby Boomers - born 1946 to 1964
- Generation X - born 1965 to 1980
- Millennials - born 1981 to 2000
- Generation Z - born 2001-2020

Furthermore, Covid-19 has caused existing workforce trends to accelerate, exacerbating the impacts of talent shortages, skill and gender gaps, polarization, and remote work. We are also witnessing a transition from a majority to minority workforce. Navigating this ever-changing environment and being able to effectively manage a generational workforce is and will be a challenge for leadership and employees alike.

What kind of challenges does this pose for employers? How will leadership manage a generational workforce with different motivators and expectations? What traits, life experiences and beliefs influence their style of work and communication? Understanding what to expect in the near future is critical to navigating the ongoing shifts of workforce demographics. Some researchers identify this as the “collapse of standardization - the ideology that the business defines the individual [39].” Leaders are focusing more resources on inclusion, diversity, and personalization efforts that drive workforce engagement and satisfaction.

2 How does it work?

The most significant transformation in the workforce since World War II is taking place and has created a global talent shortage. The Korn Ferry report indicates that by 2030 there will be 85 million unfilled roles globally due to a growing demand for professionals with technical, collaborative and leadership skills [40]. Low birth rates in Japan and many European nations and a birth decline in younger women in the United States has reached an all-time high. 2020 had a record 4% decline in birth rates in the United States, the largest single-year decrease in nearly 50 years [41]. Alongside declining birth rates, younger people are waiting longer to start families and “settle down”, enabling them to work longer and be more agile in their careers. Additionally, the population of older Americans is expected to more than double between 2014 and 2060 [42]. Declining birth rates, an increase in life expectancy, and agile workers have led to a generational workforce that permeates most industries.

The most recent generations are significantly more diverse, and this trend is expected to continue. Millennials are increasingly likely to be foreign-born with their first language being something other than English. Additionally, more “Gen Zers (48%) and Millennials (38%) are identifying as non-White, with Gen Z predicted to be majority non-White by 2026 [43]”. More women are entering the workforce and currently account for just over 51% of U.S. managers and professionals [44]. Additionally, 80% of millennial couples are two-income households compared to 47% of Boomer couples [45]. Furthermore, the rising cost of homeownership and education has led to an increase of current Generation Zers studying longer and entering the workforce later. This trend is expected to continue for the next two decades. We are also witnessing a larger cohort of older workers alongside an aging workforce [46]. The rise of remote work due to Covid-19 has removed most physical barriers to employment, enabling professionals of

diverse backgrounds to secure roles they would have otherwise been disqualified for due to geography. Job opportunities beyond state and national borders has led to a more dispersed workforce that is equally as diverse.

Supporting these shifting demographics and enabling them in the workplace begins with building awareness and providing necessary tools to teams. Diverse companies enjoy a 2.3 times higher cash flow per employee, and are 35% more likely to perform better [47]. Recognizing a demographically diverse workplace as an opportunity to improve will be key for leaders in the next decade.

3 Who's doing it?

Workforce demographic changes are permeating all industries and impacting every sector of business. Enterprise software giant SAP is actively capitalizing on opportunities to create a demographically diverse workforce while encouraging growth in their industry. Jennifer Morgan, the first woman to sit on SAP's executive board and the first woman to lead the company as CEO, has led the charge in ensuring a diverse workforce. Morgan says "My goal is to make inclusion the default option, so that it's actually harder to exclude than it is to include", when asked about her thoughts on inclusion in the workplace [48]. The company boasts over 80 employee network groups with over 20,000 active members. There are groups for members of all demographics including veterans, differently-abled professionals, and LGBTQ+.

Additionally, SAP has taken steps to improve the school-to-work pipeline by investing in Historically Black Colleges and Universities (HBCUs). They have also recognized the potential of neurologically diverse talent and have created an Autism at Work program that includes pre-employment training. As they encounter a large multi-generational workforce, they have created the Cross-Generational Intelligence Initiative to create a cohesive environment for collaboration between generational employees. Other companies are making similar investments in their workforce as they understand the importance of engaging changing teams.

4 Why is it significant?

According to Deloitte, "Seventy percent of organizations say leading multigenerational workforces is important or very important for their success over the next 12–18 months, but only 10 percent say they are very ready to address this trend [49]." Understanding how the workforce is changing is key for continued success and growth. Leaders and managers must be prepared to approach work with an agile mindset, ready for collaboration and shifts at a moment's notice. Leadership must provide managers with tools that illustrate the age, gender, race and other demographic breakdowns, while educating them on how to effectively lead and direct various backgrounds. Strategies in recruitment, orientation, talent management, retention and succession planning may need to be adjusted to account for a more diverse and increasingly aging population.

As workers of all demographics become more vocal about their needs, leaders need to be prepared to fulfill them with support from management. Managers need to be more aware that different populations have different communication styles, motivations, and worldviews.

There are also significant gains to be made when managers and leaders invest and leverage a changing workforce. According to McKinsey Global, equal gender representation in the workplace could raise global GDP by \$28 trillion if women play an identical role in labor markets as men. Additionally, businesses with diverse management teams enjoyed a 19% increase in revenue compared to less diverse businesses [50]. Leaders of tomorrow must recognize the value in creating flexibility around where and how people perform their roles. There needs to be a mindset shift in how policy and culture nurture an environment of acceptance, inclusivity and flexibility.

5 What are the downsides?

There can be challenges to managing and leading a diverse workforce. Research from Purdue Global University outlines the following characteristics that define the five generations in the workforce [38]. Recognizing these characteristics can help leaders as they navigate this landscape.

- Traditionalists - born 1925 to 1945
Dependable, Straightforward, Tactful, Loyal
Shaped by: The Great Depression, World War II, radio and movies
Motivated by: Respect, recognition, providing long-term value to the company
Communication style: Personal touch, handwritten notes instead of email
Worldview: Obedience over individualism; age equals seniority; advancing through the hierarchy
Employers should: Provide satisfying work and opportunities to contribute; emphasize stability
- Baby Boomers - born 1946 to 1964
Optimistic, competitive, workaholic, team-oriented
Shaped by: The Vietnam War, civil rights movement, Watergate
Motivated by: Company loyalty, teamwork, duty
Communication style: Whatever is most efficient, including phone calls and face to face
Worldview: Achievement comes after paying one's dues; sacrifice for success
Employers should: Provide them with specific goals and deadlines; put them in mentor roles; offer coaching-style feedback
- Generation X - born 1965 to 1980
Flexible, informal, skeptical, independent
Shaped by: The AIDS epidemic, the fall of the Berlin Wall, the dot-com boom
Motivated by: Diversity, work-life balance, their personal-professional interests rather than the company's interests
Communication style: Whatever is most efficient, including phone calls and face to face
Worldview: Favoring diversity; quick to move on if their employer fails to meet their needs; resistant to change at work if it affects their personal lives
Employers should: Give them immediate feedback; provide flexible work arrangements and work-life balance; extend opportunities for personal development
- Millennials - born 1981 to 2000
Competitive, civic and open-minded, achievement-oriented
Shaped by: Columbine, 9/11, the internet
Motivated by: Responsibility, the quality of their manager, unique work experiences
Communication style: IMs, texts, and email
Worldview: Seeking challenge, growth, and development; a fun work life and work-life balance; likely to leave an organization if the culture is resistant to change

Employers should: Get to know them personally; manage by results; be flexible on their schedule and work assignments; provide immediate feedback

- Generation Z - born 2001-2020
Global, entrepreneurial, progressive, less focused
Shaped by: Life after 9/11, the Great Recession, access to technology from a young age
Motivated by: Diversity, personalization, individuality, creativity
Communication style: IMs, texts, social media
Worldview: Self-identifying as digital device addicts; valuing independence and individuality; preferring to work with millennial managers, innovative co-workers, and new technologies
Employers should: Offer opportunities to work on multiple projects at the same time; provide work-life balance; allow them to be self-directed and independent

Managing a multi-generational and more diverse workforce comes with an array of challenges, but as previously iterated, the social and economic benefits of investing in diversity, inclusion and a well-rounded workforce are substantial.

6 Where is it going?

As demographic shifts in the workplace continue, workers and institutions will need to invest in reskilling efforts at an incredible scale, while also redefining areas of skills that are in demand. Companies and businesses that view diversity as a resource will thrive, while those that choose to silo themselves will face difficult challenges socially, culturally, and economically. As the workforce continues to age, businesses will begin allocating additional resources to support this population while creating collaboration and inclusion training to drive stronger results. In 2030, 690 million baby boomers will reach retirement age and 1.3 billion members of Gen Z will enter the labor force, creating even more changes in expectations and worker norms [51]. These shifts will continue to impact how leaders approach and respond to the changing workforce. Reskilling efforts will increase and reach all-time peaks as companies face a lack of skilled laborers on the market. Women and other minority populations will continue to hold more leadership positions and begin to influence the direction and position of businesses at a larger scale. The workforce is changing at an incredible rate and leaders must be prepared to navigate this space effectively.

Industry Forecast

Thought Leader: Steve Walker

Position: Chairman & CEO, Walker Information, Inc.

Area for Disruption: Diversity and inclusive practices in the workplace.

Professional Insight:

The most significant disruptor in management and leadership practices is JEDI (justice, equity, diversity, and inclusion). JEDI is ensuring that there is more diverse representation among leadership at all levels of a company. This is significant because “there is power in diversity, and businesses of all sizes need to embrace it. Diversity will become an area of competition for business to attract talent.”

Industry Forecast

Thought Leader: Andrea Richter-Garry

Position: VP, International Engagement, Indiana Economic Development Corporation

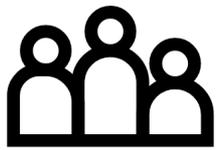
Area for Disruption: How are we training our workforce for jobs and technologies that don't exist yet, or are in development..

Professional Insight:

“Technology itself isn't disruption; how the technology is applied is the disruption. The workforce's ability to apply technology and training will make disruption possible. Vocational training and community colleges are becoming more valued in their ability to develop workforces. There will be a more focused targeting of how we develop training to fill new jobs.”

Informational Resources

[Demographic Workplace Trends](#)
[The Postgenerational Workforce](#)
[Generational Motivations](#)



Leading, Managing, and Developing Diverse Teams

1 What is it?

A diverse team refers to an organization made up of collaborators from different backgrounds. These backgrounds include, but are not limited to, education, race, religion, gender, sexual orientation, socioeconomic status, or national origin. As businesses continue to seek more equity socially, there is also a desire to ensure that workforce teams reflect the value of diversity. It is important to note that this can manifest differently from workplace to workplace, but overall there is increasing desire to ensure that all voices on a team are heard equally, regardless of their identity.

Increasingly, there is an emphasis on diversity in terms of educational background and experience. Historically, a majority of upper- and middle-income employees come from a college-educated background. This trend is shifting into a new realm where an increased number of emerging professionals are evolving their academic pursuits to include certifications, specialized training, and other less-traditional paths. This calls for a serious understanding of how best to lead teams with an incredibly different skill set from what has historically been the standard.

2 How does it work?

The key to inclusive leadership is stimulating teams by providing them the knowledge that their diverse backgrounds are valued as an asset, rather than being seen as something cumbersome. “Inclusive leadership is energizing and motivating; each employee feels authentically valued and respected and is engaged in achieving a shared vision. Inclusive leaders effectively lead diverse teams by creating workplaces where all employees feel valued for who they are, and know their ideas count [52].”

There can be a significant issue with employees from

a minority background entering into a workplace and feeling silenced. To understand this, one must understand the concept of implicit bias when it comes to trusting others in the workforce. People have a subconscious tendency to be drawn towards those with similar characteristics as themselves. “You subconsciously look for points of similarity in everyone you meet because similarities make you feel safer [53].” This can lead to team leaders listening to or engaging more with employees that are similar to them. In turn, this causes those who are not similar to them to feel devalued and unmotivated.

To alleviate this, there must not only be value and respect expressed by the leaders for people from all backgrounds, but there must be clear repercussions to those who do not show the same; otherwise, that respect feels inauthentic. “They [leaders] should hold others accountable for disrespectful behavior toward different others. Inclusive leaders should articulate the value of diversity for team effectiveness and show a commitment to diversity in hiring, advancement, compensation, and retention practices. And, inclusive leaders should demonstrate a willingness to learn from diverse perspectives [52].” Leaders are challenged with ensuring their work environments are suitable and provide an environment that encourages growth for all.

3 Who’s doing it?

We are seeing this as a growing trend across all businesses and industries. Many companies are noticing that focusing on developing diversity within their teams leads to success in a variety of other aspects of their company. One industry leader in the professional services and technology space that is dedicated to diversity is Accenture.

With over half-a-million employees, Accenture's leadership prides itself on its belief that there should be equal opportunity for all employees, regardless of their identity. They believe "no one should be discriminated against because of their differences, such as age, disability, ethnicity, gender, gender identity and expression, religion or sexual orientation [53]." This leads to them training their teams to be more aware of how to respect diverse perspectives, as well as recognize the benefits of working with a more diverse team. Accenture realizes these benefits at a higher scale than most firms its size, with women making up 40% of their global workforce, and multicultural women making up 19.6% [54].

Accenture even offers a variety of special accommodations for its employees. This includes assistive technologies for those with disabilities, offers of additional training for those whose educational background may not have equipped them to the same extent as others, and insurance coverage for gender affirmation surgery to ensure all employees are mentally well.

4 Why is it significant?

One of the key reasons it is important to know how to properly lead a diverse team is because all workplaces of the future will be inherently diverse. Demographic, social, and economic trends indicate that even the most traditionally segregated and monolithic industries will be increasingly infused with individuals of diverse backgrounds and identities in the future. The aforementioned necessity to make workplaces more welcoming and open to those with diverse educational backgrounds is rooted in a shift for traditional graduates of four-year schools. According to new data from the National Student Clearinghouse, undergraduate enrollment (this fall) declined by 3.6% from the fall of 2019. That's more than 560,000 students and twice the rate of enrollment decline seen since 2019. Most of that decline occurred at community colleges, where enrollment fell by more than 10%, or more than 544,000 students [55].

With growing conversations surrounding whether the investment into higher education is worth it, businesses are presented with candidates who haven't acquired secondary or tertiary degrees. This presents a need for leaders to develop teams that can welcome, train, and encourage team members who have

diverse levels of education and experience.

Additionally, we are seeing major strides towards equality for racial minorities. Because of this, it is important for leaders to understand that developing teams made up of a variety of professionals from different ethnic backgrounds is beneficial. Research indicates that higher levels of ethnic diversity increase revenue by a whopping 15%. According to Glassdoor, 67% of active and passive job seekers say that when evaluating companies and job offers, it is important to them that the company has a diverse workforce [53]. As more job seekers emphasize diversity and inclusion as a deciding factor in accepting employment, businesses and leaders can distinguish themselves by making these components a priority.

On top of that, ethnic diversity in a workplace is found to broaden a customer base. "A diverse collection of skills and experiences (e.g. languages, cultural understanding) allows a company to provide service to customers on a global basis [56]." A workplace and team that comes from a variety of different backgrounds can be more understanding and catering towards a multitude of people and markets. Overall, focusing on and fostering diversity has significant and demonstrable benefits to businesses and leadership alike.

5 What are the downsides?

While it comes with a myriad of benefits, there are downsides to leading and working with diverse teams. One aspect of this can come in growing pains for a company. As you make the change towards focusing on more diverse teams, people will have to adjust to working with people who are dissimilar to them. This may seem easy, but many reports find that it can be quite taxing on a workforce. When "you have several different people coming from unique backgrounds, a diverse work environment will create more conflict over time. Even different working styles can begin grating on the nerves of teammates. If this issue is not managed proactively, an increase in co-worker complaints may occur, leading to more administrative time on investigations than managing projects or contracts [57]." Businesses will need to allocate resources to mitigate the negative impacts of change, while also dedicating resources to ensure their workforce understands the value of diversity and collaboration.

Challenges related to communication also arise. Regarding educational diversity, there may be a barrier when it comes to vernacular. People using terminology that someone from a different academic level hasn't been exposed to could easily lead to miscommunication or even hostility. Management must be cognizant of this and be prepared to guide their teams through this with patience and empathy. Team members have to work harder to connect and reap the benefits of diversity. Business leaders must implement the proper diversity and awareness training to ensure an inclusive and equitable environment for all.

Some people feel that diversity is an unnecessary focus; if those people have been in the majority for most of their life, they may feel that increased diversity is an attack on their identity. While this is not the reality of diversity in the workplace, those concerns must be addressed. "There will always be people in the workplace who argue against a diversity initiative. The stresses they experience become open sores that eventually create outbursts of frustration from the affected party. Over time, if this issue is not addressed, the morale of the office will go down [57]." Leaders must work to make sure that those who do not see the benefit of diversity come to understand why it is a necessity. Without buy-in, internal opponents to diversity can stifle productivity and propagate hostility.

6 Where is it going?

When it comes to developing diverse teams, companies are likely to continue creating diversity standards and promises that percentages of their workforce will be made up of a certain minority group. This is meant to promote diversity and better reflect actual populations. Accenture has committed to ensuring that fifty percent of its global workforce, executives, and board members will be women by 2025. They are also focusing on narrowing the pay gap by ensuring that women are getting pay raises and promotions at an equal rate to their male counterparts [54].

We also see trends from companies such as Salesforce committing to similar policies with ethnic diversity and queer representation in mind. "We strive to create a workplace that reflects the diverse communities around us and where everyone feels

seen, heard, valued, and empowered to succeed. As part of our vision of building a workplace that looks like a society, we published a representation goal last year of having 50% of our U.S. workforce made up of underrepresented groups [black, Latinx, indigenous, multiracial, LGBTQ+ employees] by 2023 [58]."

These approaches set an enduring precedent for diversity-minded leadership of the future. Public, leadership-driven commitments and standards lift diversity from theory to practice, ensuring that inclusion isn't simply an ideal, but an actionable process. This process promises minority employees the opportunity to feel represented and heard. Intentional, inclusive leaders will play defining roles in creating an environment conducive to mutual growth, understanding, and prosperity.

Industry Forecast

Thought Leader: Fritz Vandover, Ph.D.

Position: Educational Technologies Consultant, University of Minnesota

Area for Disruption: The meta-disruption of the downward demographic trend in high school graduates, flat income growth among most American families, and decreased public funding for higher education.

Professional Insight:

"The U.S. is entering a period when there will be significantly fewer and fewer high school graduates, which has long been the primary audience for postsecondary education. At the same time, an increasing amount of these remaining graduates are from demographic segments (BIPOC communities) that tend to be in lower income quintiles that 1) do not tend to have financial resources to pay for postsecondary education outright and 2) have not experienced significant real (as in real dollar adjusted for inflation) income growth in the last 40 years. Lastly, the American political environment has largely not favored broad public funding support for higher education in the form of state appropriations (for public institutions of higher education) nor increased individual grant amounts for federal student aid programs such as the Pell Grant program.

In short, the post-World War II U.S. higher

Informational Resources

[Advantages and Disadvantages of Diversity in the Workplace](#)
[Companies Embracing Diversity](#)

education ecosystem was built on a decades-long wave of (and an implicit expectation of) growing populations, growing household income, and strong public funding support. The meta-disruption I am describing is going to put immense pressure on the ~4,500 postsecondary institutions in the U.S. as they compete for a shrinking pool of 18-24 year old students whose families have less means to pay for college.”

Industry Forecast

Thought Leader: Jay Ray

Position: Technology Operations Manager, UW-Madison Libraries

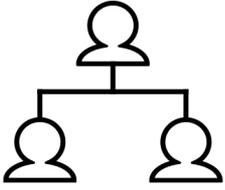
Area for Disruption: Equity, Diversity, and Inclusion (EDI)

Professional Insight:

“Equity, Diversity, and Inclusion focuses on diversifying the viewpoints and experiences of a workforce to enable more creative problem solving. Leaders of the future need to value diversity and seek it out intentionally to ensure they remain relevant in steadily more diverse populations.

EDI work is set to gain momentum for multiple reasons: diversity is becoming a given in the workforce with more categorizations of people and less homogeneity overall; diversity is seen as a good PR move; and diversity is shown to improve businesses in a variety of ways. Any companies that ignore this trend will be left in the dust and replaced with more open-minded and intentional businesses. In the future, Recruitment/Hiring/Promotion will be affected as a person will not be seen as prepared to lead if they are unable to discuss these issues at a deep, nuanced, and complex level, while also needing to surface, grapple with, and discuss openly their own biases and prejudices.

This shift to value EDI work has begun; it will accelerate and become more prevalent in the next few years, as historically prejudiced generations exit the workforce and are replaced by younger groups that have been raised to value diversity at a deeper level.”



Managing Distributed Teams

1 What is it?

The COVID-19 pandemic accelerated the transition to remote and distributed work, creating unprecedented stress on the technological infrastructure of individuals and organizations worldwide. The result of this exponential digital transformation introduced a commensurate increase in the virtual workforce, leading organizations to support employees in locations away from the central office. It is with this context that distributed teams refer to organizations that contain employees located outside of a central office or location. Because the impacts of distributed teams are all-encompassing, even organizations with a small percentage of remote employees will benefit from the insights in this section.

As the virtual workforce proliferates worldwide, leaders must realize that managing a distributed team involves engaging both on-premise and remote workers. These leaders must also remain aware that, while technology enables virtual work, introducing more technology alone will not sufficiently bridge the gap between headquartered and remote employees. Organizations must realize that the migration to distributed teams is not purely digital. Managing a distributed workforce is not as much an exercise in digital dexterity as it is an intentional operational transformation.

This shift to remote work introduces unprecedented opportunity for employees and organizations alike. Organizations may now hire from global talent pools while employees may have greater flexibility and autonomy at work. Despite the potential for expansion, an organization and its leadership team must consider several factors as they transcend physical boundaries into virtual ones. Among these considerations are the increased importance of employee engagement, redesigning the application of technology and the framework it exists within, and operational transformations that align employee autonomy and organizational strategies. In redesigning the workplace, management must realize

that flexible work locations are a critical factor in talent retention and must adapt their management styles accordingly.

2 How does it work?

Managing distributed teams requires thought and extensive planning. While technology serves as the foundation for successful management of distributed teams, the operational paradigm allows the technology game plan to flourish. In developing a technology strategy, organizations can build around the “pyramid of responsiveness” driven by how the employees will use their technological tools. As Forbes highlights, this pyramid of responsiveness is divided into three categories: time-sensitive and real-time information sharing, effective but less-responsive tools, and non-real-time information repositories.

Tools such as Slack are useful for real-time communications and collaboration. While Slack may be a proxy for high frequency in-person interactions, persistent notifications and tracking of chat threads can be daunting and unproductive. For lesser volume and more manageable notifications, tools such as email are considered in the middle tier. It is in this tier that longer form communications may also be sent. Platforms such as Google Docs and document management through Microsoft Teams serve as information repositories and non-real-time collaboration tools. Employees can revert to these documents as the master collaboration medium, though they would not be used as a primary mode of communication. It is recommended that, as projects become more actionable, teams move down the list from highly responsive communication to powerful document sharing [59].

The value in each of these technologies is that they

can be accessed remotely from anywhere in the world. Headquartered employees in Illinois are able to seamlessly interact with a distributed worker in London, England. As these tools break the barriers in collaboration, management must be mindful of how they are used in order to optimize processes and teamwork. To best optimize collaboration, leaders should aim to establish accountability, adapt communication styles, prioritize transparency, and build around flexibility and productivity.

- Establish accountability

Managing distributed and remote workers will introduce a degree of autonomy in scheduling and workflow. There is less visibility among remote management and teams; therefore, communication around deliverables, timeline expectations, and clear metrics enable the team to effectively prioritize project tasks. Regular checkpoint meetings and clearly defined outcomes can assist managers in ensuring the needs of the organization are met. While managing a distributed team, workflows may be non-linear. Employees in Europe or the Asia-Pacific region will be operating in different time zones than their counterparts in the United States. Clearly establishing leadership practices and goals will help teams to determine critical tasks and optimize their schedule around completing these tasks rather than arbitrary expectations that do not fit within the operational paradigm of the employee. Defining leadership roles and production metrics sets a true north for all employees.

- Adapt communication styles

According to research completed by Albert Mehrabian in the late 1960s, it was found that only 7% of communication is verbal. Mehrabian declares that 38% of communication is driven by tonality while 55% is driven by body language [60].

With body language largely absent in virtual communications, open-source software development titan HashiCorp recommends placing greater emphasis on team-building efforts and supplementing virtual communications with emotional context in the form of emojis. “In virtual communications, the use of emojis are encouraged as a substitute for body language. HashiCorp hosts a company-wide meetup once a year... the focus is not on company goals and objectives. Instead, these meet-ups emphasize the importance of developing trust and fostering strong bonds between and among employees [59].”

While annual “meet ups” may not be the optimal

form of connection within each organization, leadership must understand that distributed employees have different communication needs than traditional employees. Company policies affect all employees, and failure to consider the unique situations of distributed workers can lead the distributed workforce to be disengaged and disconnected from the company. At a 2019 lecture at Ball State University, President of Muncie, Indiana-based Ontario Systems Jason Harrington spoke to the power of thoughtfully considering remote workers. He noted that remote workers can feel forgotten and underappreciated as they see social media posts of colleagues participating in an interoffice ice-cream social. To ameliorate the disconnect, the company sent out gift cards and notes of appreciation to remote employees to demonstrate unity and gratitude. Tailoring communications with distributed workers is critical. Taking time to connect via videoconferencing can also be a powerful engagement tool that broadens connections for employees in disparate locations.

- Prioritize transparency

As the COVID-19 pandemic expedited the transition to virtual work, it introduced conflicting paradigms regarding how to measure whether employees were actually working. Transparency in this regard is not to be conflated with micro-management; rather, it serves a specific purpose: to increase visibility of company-wide updates and important changes. Transparency may also include check-in conversations to clarify roadblocks that may present themselves to remote workers. The goal with transparency initiatives is for the distributed workforce to understand that they are integral to the company’s function and critical members of the team. Drawing on the HashiCorp approach, “the company hosts its weekly all-hands meetings on Thursday mornings PST, a time that tends to accommodate a wide range of time zones...employees are encouraged to submit questions. No question is off the table. All questions are answered, either during the all-hands or via a follow-up email. The all-hands is recorded and content is distributed widely to ensure that all employees are able to consume the information [59].”

Additionally, Slack channels and Google-based communications are public, so distributed workers may stay plugged into engagement and company-shared announcements. Having access to more information leads to better informed decisions and more sound self-organization within distributed teams. Leaders must also avoid inundating the workforce

with information, as that practice can spiral into overwork and anxiety. This point emphasizes the importance of considering how organizations share information and solicit engagement through prioritizing community and involvement.

- **Build around flexibility and productivity**
According to a study conducted by the Harvard Business Review of 1,583 white-collar workers, “34% of respondents reporting that the structure of their workday makes it challenging to perform in a sustainable way over time. In an economy where productivity is stagnant across the board, largely owing to a culture of overwork, flexibility is a key disruptor for improving productivity... Employees without access to flexibility are twice as likely to report being dissatisfied at work, and half of employees say they would leave their company if offered a more flexible alternative [61].”

A separate study conducted by Virgin revealed that “70% of employees say going into the office isn’t necessary [59].” While this may confirm processes in place for distributed teams, organizations should consider these ramifications on headquartered or centralized employees as well. Affording the flexibility and ability to optimize for productivity may be just as important to in-person workers as remote workers. Truly maximizing the distributed culture requires allowing all employees, regardless of geographic position, to be treated as equals.

Creating an inclusive environment built upon these principles allows organizations to not only shift the “how” behind operations, but the “why” as well. Understanding that all employees have fundamental needs that drive productivity, engagement, and retention are critical to the success of managers and organizations. Each organization varies, thus, these principles will be tailored accordingly. However, the underlying tenets of these principles will transcend industries.

3 Who’s doing it?

TripActions is a business travel management company that features employees in over 7 different countries. Despite being headquartered in Palo Alto, California, TripActions has leveraged co-location spaces throughout the United States, Europe, and Australia to hire employees whose location is closest to

growing customer bases. Because they have more than 750 employees across the globe, TripAction can meet the needs of customers based on location preferences rather than providing real-time services strictly on United States Pacific Standard Time. Location flexibility also allows them the ability to hire the best talent regardless of residential area. TripActions has leveraged services such as WeWork to assist in this opportunity. “WeWork has enabled us to hire great talent that we otherwise wouldn’t have been able to,” says Leslie Kurkjian Crowe, chief people officer of TripActions. “Instead of being siloed in our Palo Alto headquarters, we now recruit the very best talent in cities all over the globe [62].”

As global talent makes itself available to companies, Salesforce highlights the practices it maintains in order to retain this talent and enable a strong distributed culture. “Regular communication is vital for giving employees a sense of togetherness, clarity around the wider business and, frankly, sanity. We’re social beings – we’re not designed to sit indoors with minimal contact with others. So, it’s helpful to over-communicate, even if it feels unnatural. We’ve found customers and stakeholders have responded well to updates that answer pressing needs. It’s also an opportunity to start a dialogue, gather valuable feedback and root out and solve hidden issues [63].”

Salesforce has leveraged virtual knowledge hubs and distributed communication channels to share insights gained from frequently asked questions, disseminating them across the organization to prevent duplicated efforts across teams. Open communication channels allow for access to various members of teams while soliciting unique insights from various areas of expertise. With disruption occurring in personal and corporate routines, strategies and modes of communication have been implemented to encourage more transparent communication and collaboration.

Salesforce also emphasizes the importance of well-being. Through investing in the continued development of their staff, Salesforce has ensured that it provides content that prioritizes self-care and growth. “Companies that go out of their way to make employee wellbeing a non-negotiable have engaged workforces. And by looking after employees, you give them the head space to look after customers – which means a productive remote workforce, doing more work, better [63].”

There is a positive ripple effect that is felt when companies effectively manage their distributed teams. These two organizations represent the potential for growth and better engaged workforces which create value for the end user.

4 Why is it significant?

In an interview with the Washington Post, Chad Hooper, national president of the Professional Managers Association, which represents thousands of IRS managers and advises the agency on operations and policy, summarized the significance of being able to effectively accommodate and manage distributed teams by saying, “Telework leads to better hiring, because there are positions that are tied to geography unnecessarily... There are support and operations roles that don’t impact the public, we want the best candidates to fill those roles [64].”

Hooper’s emphasis on increasing the talent pool is not a point that is lightly taken. Increasing geographical range of the workforce also invites greater insights derived from the expertise of the diversity in people. Rather than being confined to traditional work hours of centrally located employees, organizations can cover more hours in the day spread across different time zones and people. This geographic distribution also enables organizations to increase their presence in surrounding areas of greatest market share and customer base. Additionally, a greater percentage of the workforce is placing increasing priority on flexibility of location and time

In the previously referenced 1,583 person study conducted by the Harvard Business Review, they found that “96% of employees said they need flexibility, yet only 47% reported having access to the types of flexibility they need — a gap of 54%. This gap is even more pronounced for women, only 34% of whom have access to the flexibility they need...Of the employees who did report having access to some flexibility, only 19% said they had access to structured flexibility programs. A structured flexibility program is one in which employees have a range of flexibility options to choose from and those options are broadly communicated across an organization [61].”

Pairing these sentiments with additional context of the study that reads “half of employees say they would leave their company if offered a more flexible

alternative” amplifies the significance in a company’s willingness to dedicate resources to developing distributed teams [61].

Synergizing the effects of higher employee retention, hiring top tier talent, and divesting from long-term lease agreements to support employees in non-centrally located offices and the benefit of distributed workforces is immeasurable. Reducing capital expenditures and increasing awareness of how to better integrate remote and headquartered employees will continue to become a disruptor.

While reconsidering investment strategy surrounding these employees, organizations will discover that impacts to policies and procedures will be significant. Optimizing workflows and flexibility of scheduling will force organizations that succeed into the future to reduce silos between IT, HR, marketing, sales, and development teams. Distributed workforces will require democratized information and communication channels to better inform customer interactions and revolutionize how organizations do business.

5 What are the downsides?

Many of the rewards associated with effective management of distributed teams are highlighted in the context of avoiding the pitfalls associated with mismanagement of these teams. Failure to properly engage and communicate with the distributed workforce can have negative effects on productivity and agility. The first downsides that lends itself to potential mismanagement of a distributed workforce is the lack of interpersonal interactions. The inability to connect in-person leaves managers with having to consider alternative ways of providing meaningful contact to their remote workforce. Management cannot afford to drive contact strictly through the 7% of human communication residing in voice-based contact. The missing 55% of body language is a natural downside to distributed work and one that could lead to employees feeling disconnected from coworkers and company culture.

Moreover, researchers Mahdi Roghanizad and Vanessa K. Bohns conducted a study that revealed the effectiveness of face-to-face communication. Forbes summarizes the study’s findings by stating that “a face-to-face request has been shown to be 34 times more successful in terms of gaining acceptance, as

6 Where is it going?

compared to email. Moreover, remote meetings generate, on average, 10 ideas, as compared to in-person meetings, which generate an average of 13 [59].” Initiating contact with non-verbal cues is paramount even in the digital age.

A second downside closely aligns with failure to properly communicate. Ensuring that all employees have access to pertinent information, or the tools to obtain said information, is critical. In addition to rethinking communication styles, management may also have to reconsider workflows to optimize the talent and time of remote workers. Inundating employees with notifications and unorganized chat tools can severely limit effectiveness and productivity.

As this technological enablement is addressed, leaders must also consider the third risk, which is associated with cybersecurity risks that arise as elevated permissions to company information are granted. Ensuring that company-public chat platforms and virtual meetings are properly secured is instrumental to ensuring that potentially sensitive information is not stolen or improperly shared. The organization must consider its security protocols and how it plans to ensure security measures are followed and maintained whether employees are centrally located or distributed. Laptop security, password protections and encryptions, secure virtual private networks (VPNs), and other precautions must be considered as management seeks to further engage their teams.

Despite growing demands for flexible work and autonomy, the final downside in this overview lies in the potential for work not completely aligning with company strategy. In developing proper communication channels, leaders must also consider whether objectives, metrics, and leadership is properly identified. As a distributed workforce allows for the potential to attract and retain top talent, management must ensure that the talent is channeling the efforts in a meaningful way. Ameliorating this potential drawback can be addressed through frequent communication and a commitment to engaging employees through transparency and trust.

Awareness and willingness to address organizational limitations are critical assets in allowing organizations to effectively bridge the gap between distributed teams and the company mission. Cultivating a paradigm that supports greater communication and emphasis on trust can be an effective first step toward a more integrated distributed workforce.

Co-location offices such as WeWork allow remote employees to have an office space that is provided by third-party companies and is separate from company-specific office spaces. These co-location environments allow companies to hire remote employees while giving these employees a non-headquartered place to work. As previously iterated, 70% of workers believe that reporting to a central office is unnecessary.

Technology enables these cross-location, cross-functional teams to collaborate seamlessly while building relationships. Managers must understand these technologies to optimize their workforces and reduce friction in processes and procedures. While communication tools are seemingly endless, leaders and managers should understand the motivations behind why staff use these tools. In an interview with Dropbox, Chris Marsh, Research Director of 451 Research explains “I think more companies should actually think about how they can address the things that people go to conversational tools for so that they don’t have to go there.’ The more people have visibility into goals and project status, the less they have to ask someone for it [65].” This point emphasizes the need to reimagine work environments rather than utilizing digital tools to substitute in-person interactions. Through enabling greater autonomy in the workplace, employees can optimize their workflows for greater efficiency.

Leaders should also be aware of the “trap of more.” In other words, more tools, more transparency do not always lead to better results. Better results stem from efficiency and effective use of tools that allow teams to have access to the information they need to drive customer relationships. Overdoing transparency, for example, can lead to heightened anxiety around the completion of tasks rather than provide boundaries that allow it to empower and inform progress and decision making. These tools should not be used to perpetuate an “always on” culture; rather, they should be designed with optimization of job tasks and employee well-being in mind.

Ultimately, this is a trend that extends beyond the confines of evolving technology. Managing distributed teams is a leadership evolution as well as a business practice evolution. There will be greater

integration between Human Resources and technological processes than ever experienced as companies seek to create policies that promote engagement and autonomy in alignment with company strategy and overall job satisfaction. Through challenging the current status quo, companies can take small steps to realize the power of a distributed workforce as it relates to their interests.

Industry Forecast

Thought Leader: Brian Rowe

Position: CEO, Perceivant

Area for Disruption: Managing a distributed workforce

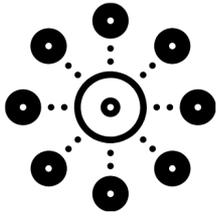
Professional Insight:

“Future managers will need to be able to hire, manage and retain talent globally, that they may never have face to face contact with. Past management and leadership has been based on building relationships in person, in an office, but now that will need to be achieved over digital mechanisms. Many managers will find they are not up to the tasks. Workers will have and demand more freedom than ever. Digital workers living in economies with higher standards of living will continue to face financial pressure.”

Informational Resources

[Leading Remote Teams](#)

[Managing Distributed Teams](#)



Decentralized and Flatter Organizations

1 What is it?

As the remote/work-from-home revolution continues to evolve, our research has found that many organizations are reconsidering the most effective ways to work and lead. As managers and area supervisors are no longer able to make guest appearances within their employee's cubicles and offices, standard methods of tracking engagement and productivity are being challenged. As these shifts in the workplace ensue, fundamental shifts to organizational structure and hierarchy are being considered as means to effectively adapt to the aforementioned revolution. Among the most highly considered shifts in our research has been the possibility of developing a decentralized or flatter organization structure.

Traditional organizational structures are built around a predefined hierarchy. The hierarchy consists of employees, supervisors, managers, and higher-level managers within a chain of command. Flat organizations eliminate or significantly reduce management layers within the organization, granting increased involvement in decision-making and responsibility for all employees. Employees are empowered to have a voice in the decision-making process as bureaucratic red tape is eliminated from the environment. Flat organizations aim to eliminate barriers in employee engagement, collaboration, and free-flowing feedback to all team members irrespective of title or role. Flat organizations are often seen as self-managed teams whereby all employees are responsible for managing their projects, schedules, and timelines. They are not receiving direction, mandates, or additional tasks from a manager.

2 How does it work?

For a flat organization to be truly effective, there must be several key elements in place. First among these elements is a shift in leadership's mindset.

In traditional hierarchies, employees are primarily seen as a means of support to the organization and its managers. The agenda, goals, and responsibilities of management take precedence in driving the key objectives of the organization. Within the flat organizational culture, management exists to support employees. Employees are seen as the main catalyst for productivity and progress. Rather than authority being imposed on employees, employees are empowered and enabled to have the necessary authority to complete the tasks relevant to their responsibilities. Leadership supports the employees with proper communication and the removal of barriers to progress.

To do this, organizations require a strong technological foundation for their staff. The ability to collaborate asynchronously across multiple devices and locations is crucial to a successful flat culture. Collaborative technologies that have emerged and accelerated in utility during the pandemic such as Microsoft Teams, Slack, and Discord, provide the backbone for distributed workforces to remain in contact and up to date on process changes, workflow changes. These technologies seamlessly allow the team to communicate regardless of location. As organizations commit to flattening their traditional hierarchies, they are effectively becoming more flexible regarding employee work schedules and locations. Now more than ever, organizations are considering whether employees need to be in the physical office space at all. The follow-up to this question has been whether all employees must function on the same schedule as well. As more organizations find that their answer is no, it does not matter, they are beginning to define different metrics for productivity. Strong technological tools allow employers to focus on outputs rather than hours spent in the office.

In short, flat organizations enable employees to make decisions, work more flexibly, and have a say in the work they do within the organization.

The hierarchical structure changes from superior down to subordinate and into one where the traditional subordinate is raised and supported through the previously imposing authority.

3 Who's doing it?

As the pandemic has accelerated the widespread support of remote work, it is clear that leading through technology is critical as we move into the future whether an organization is flat or decentralized. Companies such as Zappos, Medium, Treehouse, Buffer, and Google are organizations that have attempted the flat organizational model, with industry leaders such as Tesla making a move toward the same. Major technology companies such as Salesforce, while not entirely flat, embrace the decentralized model of work with a workforce that spans the globe. Regardless of whether the flat organization model is the ideal fit for companies moving forward, our research identifies that all sectors and industries will be impacted by distributed workforces and will require technological systems to accommodate these decentralized teams. Prioritizing employee engagement and allowing it to drive the technology that is put in place will be a major shift moving forward that will affect every industry.

4 Why is it significant?

The shift toward decentralized and flat organizations is significant because it is causing companies to re-evaluate the most important measures of future success. Companies will need to evaluate how they hire, who they hire, and the skills they look for in employees. As greater responsibility for the completion of work is passed to employees in flat and decentralized organizations, companies will evaluate and weigh criteria such as communication, self-management, and self-efficacy as inseparable from job-specific skills. As hiring metrics change, so too will hiring practices and philosophies.

Decentralized organizations can hire talent from across the country if not the globe. Geo-restrictions are lifted as a strong emphasis on the distance from the employee's location to the office is becoming less important. A company is no longer relegated to the strict talent pool within its state or city. Companies can now source the best talent virtually without

geographical limits.

Companies will also be able to save costs on overhead and office space. With fewer employees required to arrive at the office, employees will save on money otherwise spent on accommodated employees. The waterfront view or downtown location becomes less of a priority. In addition to being significant to the bottom line, organizations will have to think about how to best reallocate funds to make their culture truly unique. Businesses may consider improved benefits, stipends for co-working spaces, and investments into educational opportunities for employees. These choices will reflect on the values of the company now more than ever, thus factoring in on the quality of the company and the way it prioritizes its workforce.

Leadership's execution of the improved bottom-line will also have ramifications on employee loyalty and happiness. Through finding the balance of autonomous employees and proper avenues of communication, happiness and satisfaction will increase along with productivity and engagement. This impacts the costs associated with employee turnover and downtime accrued during new hire training. The ability to retain a strong team will have resounding impacts that influence the company well into the future.

5 What are the downsides?

There are several potential downsides that leadership should be aware of.

1. Adapting new management processes. Leadership must determine whether they trust their team to perform. Additionally, where Kanban, agile, or waterfall meetings could be held to forge key decisions, those processes will have to move to remote. Companies must consider how time zones will factor into critical meetings, creating a constant evaluation of the medium by which critical messages are conveyed. Flexibility and adaptability may be tested within organizations, especially those dependent on in-person teams and communication.
2. The company may have to reconsider its most fundamental practices. How the company hires, and trains may need to be reconfigured to optimize a remote experience. Leadership must evaluate their confidence in defining the right traits in hiring their teams. Do they now have to value entrepreneurship and self-efficacy whereas their prior system was

built to find those that received instruction well but struggle without present leadership? Does the company have the proper technological infrastructure in place along with protocols on how to use and secure it? Is leadership attached to the notion of the traditional workday and week whereby all employees function on the same schedule? It will be a paradigm shift in leadership and team development. These considerations may overwhelm the organization and may present many more challenges and risks than they are willing to take on.

3. The casual hallway conversation is no longer a viable option for building trust. Will the company be willing to rethink how it engages employees remotely and extends itself to develop relationships and trust? Leadership will have to stretch their capacity to be creative, an endeavor that depends on strong emotional intelligence and interpersonal skills.

4. Challenges to management's collective egos. Especially in the structure of a flat organization, managers that are used to every piece of information passing through them for review or approval may be frustrated by autonomous employees. Will leadership be able to separate power from respect and create a space that views employees as collaborative partners rather than those that carry out directives from upper to mid-management. Can management make the shift to supporting employees without the traditional flow of information? This may be no small shift and could significantly impact the success a company experiences in a transition to decentralized work. Management that attempts the old paradigm of micromanagement will quickly frustrate autonomous employees and dull innovation. Management will need to rethink its values and priorities. This will be a massive change.

5. To this end, accountability within a flat organization may be a challenge. Without clearly defined roles, employees may revert to more informal methods of organizing such as seniority. This may be a sign that more freedom may be too chaotic for the team as presently constituted. This lack of structure can result in work left undone and low accountability for unfinished projects. This point stresses the need to create fundamental shifts in thinking beyond processes, again, presenting more risk than the company can handle.

6 Where is it going?

The shift to servant leadership is even more prominent as we enter the era of decentralized teams. As leaders shift from traditional hierarchies, they will have their roles and responsibilities redesigned and reimaged. Managers who used to maintain a relationship where employees report to them regularly may have to rethink their dynamic altogether. As we shift away from formal command and control paradigms, managers will see a shift from facilitator to supporter. As Mark Templeton, CEO of Citrix has put it “you have to make sure you never confuse the hierarchy that you need for managing complexity with the respect that people deserve. Because that's where a lot of organizations go off track, confusing respect and hierarchy, and thinking that low on hierarchy means low respect; high on the hierarchy means high respect. So, hierarchy is a necessary evil of managing complexity, but it in no way has anything to do with respect that is owed to an individual [66].”

Whereas a manager would be responsible for delegating work and tracking the process, they are going to be tasked with considering how they can best support and remove barriers for their team, optimizing performance. As organizations remove layers of leadership in favor of more lean approaches, leaders themselves will still be valued at a premium. As the need for supportive leadership continues to be an evolving trend, managers will need to be on the lookout for how to best optimize their teams. Moving forward, decentralized teams will become the norm regardless of which type of hierarchy they fall under. Companies choosing to stay with a traditional hierarchy will still need to be mindful of the trend toward distributed workforces and the technologies that make them possible. At Google “high-scoring managers saw less turnover on their teams than the others did—and retention was related more strongly to manager quality than to seniority, performance, tenure, or promotions. The data also showed a tight connection between managers' quality and workers' happiness [67].”

GE for example is at the forefront of developing virtual reality technology that will create 4-dimensional virtual spaces where teams can collaborate. This further eliminates the need for on-location employees. Additionally, we are confident that the leadership that champions the use of these technologies, will be the leaders of the future. Regardless of the specific considerations outlined in this section, prioritizing employee engagement, harnessing employee

ingenuity, and empowering through leading technologies will allow companies to remain dynamic and sought after for years to come.

Industry Forecast

Thought Leader: Justin Shankle

Position: Product Owner, KAR Global

Area for Disruption: Autonomy given to bottom line employees

Professional Insight:

“Companies will have less middle management and require the lower folks to manage themselves better. As more autonomy is given people will be able to build things faster. Building things faster and better because they will be working first hand with the people who need the item. The companies will also become smaller. Technology will affect this as well.”

Industry Forecast

Thought Leader: Matt Ranft

Position: Director of Sales & Marketing, Fairchild Communications

Area for Disruption: Agnostic equipment opening the door for a decentralized workforce

Professional Insight:

“From a videoconferencing standpoint, there were times over the years that companies had product offerings that were proprietary, closed-looped systems where office-to-office was easy, but what we’re seeing now with Zoom and Teams with camera, microphone, network and PC agnostic, the experience is pretty similar and equal in functionality. With that comes distributed workforce, more flexibility in who you hire and where they have to live. The ability to form teams and do projects happens easier and quicker. Now that everyone has gone to desktop conferencing, I think there’s going to be an emergence to a higher-level participation type presence, a blended learning where there might be 20 people in the class and then there’s 20 monitors in the back of the class where the instructor is able to look and interact with those. The voices come from where the people are,

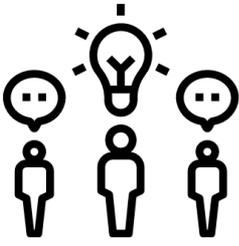
not the computer screen. Forced innovation in the teleconferencing space will replace a lot of that.”

Informational Resources

[Challenges with Distributed Teams](#)

[VR and the Future of Work](#)

[Flat Organizations](#)



Demand for Leadership at Every Level

1 What is it?

Now and in the future, every person in an organization will not only have to personify and embody the values and mission of the organization, but they will be challenged to become change agents within their organization and the environment around them. Leadership at every level will also mean that there will be a demand for transparency throughout the company, including those who are already in higher or more tenured positions of leadership.

There is now a sense of freedom and autonomy to complete tasks without micromanagement. There will still be a need for collaboration, and it will be up to the individuals to take the initiative to set their standards and processes in order to fulfill a task. There is trust within the organization, which comes with transparency, that the employees on every level will be able to accomplish objectives and meet the standards of the company, no matter their title, education, or pay grade. Trust allows for all employees to be able to take risks knowing that they have the support of their team and organization. Those are the types of actions that will define new leaders throughout the organization, and this will be seen and expected at every level.

2 How does it work?

Demanding leadership at every level works by company leaders exhibiting trust in their teams and incorporating leadership qualities into the values of the company. The continued fostering of those leadership skills and qualities for all who are a part of the organization is essential for their extended growth and development.

No man is an island unto himself...the same can be said about the leaders or owners of any business. No one can successfully do it all by themselves.

It is genuinely difficult to foster creativity and innovation in an environment where there is micromanagement and a lack of trust and transparency.

By hiring employees with strong leadership skills and strong potential leadership capabilities, an organization stands to experience growth so long as the leaders also have empathy, emotional intelligence, and resourcefulness. This will create a habitable environment where innovation is nurtured and employees have the initiative to bring ideas to fruition. With practical business knowledge of the markets and user base, this drive of innovation turns to success.

3 Who's doing it?

Many of the large corporations and tech giants have begun the trend of empowering their new employees into becoming emerging leaders. They have also begun to instill new values and concepts of leadership and autonomy within their organizations. We have entered an era where these companies are taking a different stance in their expectations of leadership in order to maximize the momentum of innovation and production to their ever-growing and changing customer base.

Let's take, for instance, Amazon. All "Amazonians" are required to know the company's 14 Leadership principles: Customer Obsession, Ownership, Invent and Simplify, Are Right A Lot, Learn and Be Curious, Hire and Develop the Best, Insist on the Highest Standards, Think Big, Bias for Action, Frugality, Earn Trust, Dive Deep, Have Backbone/Disagree and Commit, and Deliver Results [68]. Each and every one of these principles gives Amazonians a set of foundational values to apply to their roles, regardless of where an employee may begin their career in the company. Amazon expects them to continue to

emulate these values as a part of their company culture and day-to-day operations.

Another example is Netflix. In September 2020, CEO Reed Hastings published a book discussing the company called *No Rules: Netflix and the Culture of Reinvention* [69]. This book describes how he and the other executives at Netflix created a new culture in leadership and autonomy at their company. This is what he had to say on the topic of leadership at every level:

“It’s risky trusting employees as much as we do. Giving them as much freedom as we do. –But it is essential in creative companies where you have much greater risk from lack of innovation [69].”

Again, you see that they are creating a culture of trust and making their employees take charge of their own processes, operations, and as mentioned, creativity. There is much more risk to be had for a company that is at the frontier of creativity and innovation and loses that momentum than there is risk in trying to overly manage it. In summary, empower your employees to become leaders and mitigate the risk of inhibited innovation.

4 Why is it significant?

The changes in technology and the impact that it’s having in our lives is growing exponentially. To sustain that growth and to keep up with demand, companies are in a place where maintaining the status quo is dangerous. If you are not improving, your business is soon to be gone.

Having companies push their employees to have a leadership mindset allows them to engage in more agile thinking and innovation. Companies can look at data-driven decisions from their employees and not just management. Upon gathering data, employees can take initiative in actions that will result in whatever is best for the company. Again, having that culture of everyone being a leader is liberating in the aspect of all employees being able to see themselves as game changers and not just a cog in the machine.

Many millennials and Gen-Z employees have different views and ideas of their work culture and values compared to past generations. New generations that are entering the workforce want a job where they are valued and can consider themselves doing meaningful work; if the company culture does not adapt to meet those expectations, they will not hesitate to quit

and find a company culture that does. Also, in that same vein, many of the new ideas that are shaping innovation are increasingly sourced from younger generations. Organizations can leverage creativity and diversity of thought across their teams by empowering people at all levels with coaching and the tools to be leaders, as opposed to maintaining a status quo that would limit their ability to contribute and lead.

5 What are the downsides?

Though we are early in this cultural shift, there are some downsides that will impact progress. Now that the playing field of leadership is leveled, older generations may feel as though their leadership is valued less. There will be a learning curve with those who are not accustomed to having a leadership role. In work environments, teams can become impacted by “paralysis by analysis”, where a perceived pressure to lead may result in overanalysis and hesitation. In addition, it is possible that distributed leadership may eschew some of the tangible benefits of a more traditional hierarchy. Accountability, decision making, and goal setting must adapt to a decentralized leadership structure.

6 Where is it going?

This demand for leadership at every level is an emerging trend that will continue to reshape organizational power dynamics. As the culture of technology and business changes, distributed leadership will foster inclusivity and broad empowerment. Especially as organizations and employees find themselves operating in a decentralized and distributed environment, personal autonomy and widespread leadership capabilities will be critical elements of productivity and innovation. Leaders make changes, and empowering everyone to see themselves as a leader today enables their minds to foster new solutions that will impact tomorrow.

Industry Forecast

Thought Leader: Frederick Fransen

Position: CEO, Certell, Inc.

Area for Disruption: Leaders will need to be more like engineers

Professional Insight:

“Leadership will focus much more on upfront development and design of processes which can self-manage or manage through contractor relationships. Much more of the responsibility of leaders will be in design and anticipation, rather than reaction and spontaneous decision-making. This requires a different mindset. It will draw scientists or those with scientific and engineering backgrounds into business, and challenge the skill set of traditional business leaders, who tend to be more people-oriented.”

Industry Forecast

Thought Leader: Kerry Sims

Position: Vice President | Americas,
Digital Insights, Hitachi Vantara

Area for Disruption: Design thinking and leadership

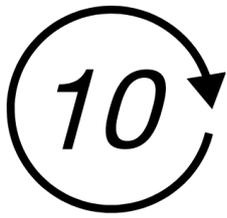
Professional Insight:

“The biggest things that we see is a need to focus on design thinking and the ability to look at conceptualized problems and look across the landscape for all the potential ways you might be able to solve it. And be able to evaluate technologies that you may never have been exposed to before. Familiarity with a broad range of technologies and their relative merits, I think, is a big part of it. But problem solving, and ecosystem thinking, is maybe more important.”

Informational Resources

[Amazon 14 Leadership Principles](#)

[Netflix Leadership](#)



Powers of 10 Leadership

1 What is it?

Today leaders already need to be able to think tactically and strategically, to move easily between long- and short-term thinking, and to see the connections across different scopes and scales. The technological trends described earlier in the Horizon Report will upend many business models and jobs while driving the creation of many new models, products, and services. These changes will occur at a whiplash pace for many. Organizations and individuals that thrive in the coming decade will have developed Powers of Ten Leadership.

We have coined the term to describe this ability to move back and forth and see connections between scales of time, execution, planning, and creation with Ray and Charles Eames's famous short film in mind. In 1977, the Eames brothers produced their award-winning Powers of Ten documentary film depicting both the relative scale of the universe on a logarithmic (or factor of ten) scale and then reducing to the same inverse power to the quantum level of protons and quarks [70].

At the time, the Powers of Ten was heralded for making clear the importance of scale and the remarkable vastness of both the large- and small-scale. Many educators, philosophers, and leaders were moved by the Eames' films and saw in them a challenge to think differently, to intentionally cultivate our understanding of the largest scale frameworks and the smallest detail. Tomorrow's leaders will face exponential change and will need this capacity for exponential Powers of Ten leadership. Those who cultivate this ability will be in high demand.

2 How does it work?

Powers of Ten Leadership comprises being able to think across different frameworks simultaneously while seeing the connections. One of the most

important, being able to think both strategically and tactically, to move back and forth between vision, long-term planning, and execution. Vinta Bansal lays out the relationship between strategic and tactics in her article on Strategic and Tactics for Techtell.com [71].

Difference between strategy and tactics: What and how of strategic planning

STRATEGY DEFINES WHAT AND WHY

1. Strategy is the intent
2. Determines what needs to be done and why by questioning its effectiveness
3. Involves intentional and focused high-level thinking that defines the direction to take
4. Aligned with the goals, objectives and the broad vision you want to achieve
5. Requires focus on defining the future
6. It is difficult to change, though entirely possible
7. Needs outward, external looking perspective into competition, market conditions
8. Typically formed by leaders within the organisation
9. Primary focus is on effectiveness, doing the right thing
10. Difficult to measure and evaluate
11. Strategic planning does not include execution details
12. Strategy is intangible

Peter Drucker explains this in his book *The Effective Executive*. [See Resources]

The first practice is to ask what needs to be done. Note that the question is not "What do I want to do?" Asking what has to be done, and taking the question seriously, is crucial for managerial success. Failure to ask this question will render even the ablest executive ineffectual.

TACTICS DEFINES HOW AND WHEN

1. Tactics is putting intent to action
2. Determines how it must be done by focusing on the efficiency (cost, effort, resources)
3. Involves concrete actions and steps to implementation inline with the direction
4. Aligned with the strategy
5. Requires day-to-day execution directed towards a specific strategy
6. It is very easy to change offering a lot of flexibility in determining steps to make the strategy successful
7. Needs inward view that can be executed with the resources of the organisation
8. Typically defined and executed by managers
9. Primary focus is on efficiency, doing it right with less resources, time and money
10. Easy to evaluate through well-defined metrics
11. Tactical plans includes timelines and implementation details, when and where they will be applied
12. Tactics are tangible

Another key scale for Powers of Ten Thinking is the ability to think across the scale of time. Leaders will need an intentional capacity to understand what is happening now, what the relative pace for changes will be, and what is imaginable in a longer time frame.

3 Who's doing it?

Serial entrepreneur Luke Hohmann is an example of a successful innovator and business leader who has developed his Power of Ten Leadership skills. Luke has built multiple successful businesses by being able to see long-term trends, for identifying viable new needs and opportunities at the line of the horizon. He couples this ability to see future trends with an ability to convert them into specific new products and services to address these needs and opportunities. And, Luke can develop specific plans to execute a vision for new products and services. As a Power of Ten Leader, he can translate between needs, strategy, plan, and execution details.

4 Why is it significant?

Powers of Ten Leaders will be essential because the pace and magnitude of change will happen in

compression. Most organizations have relied on discrete processes, teams, and leaders to handle planning and execution. To match the pace and competitive demands of tomorrow, Power of Ten leaders will be invaluable for organizations. Businesses will need to prioritize attracting talent of a high caliber and experience to maximize their bandwidth while driving successful organizations. Management that recognizes Powers of Ten Leaders as an asset to success will compete to retain these individuals and ensure they are in a position to make significant advances both professionally but also for their firms. As the pace and amount of change that businesses and industries experience continues to rise, Powers of Ten Leaders will become essential components of every successful business and will inevitably drive disruptive change themselves.

5 What are the downsides?

While there are no inherent downsides to Powers of Ten Leadership, the challenge will be scarcity and capacity. There are few leaders who have developed the abilities required for Powers of Ten Leadership. Organizations will need to develop processes to help their leaders develop the required skills and perspectives. These processes will require time and significant resources to become fully developed and serve the business needs of organizations. Additionally, Powers of Ten Leaders are and will continue to be in high demand, creating a more competitive structure between companies who secure and retain these rare leaders.

6 Where is it going?

Companies will need to develop Powers of Ten Leaders at all levels of the organization. With continued investment and resource allocation, these leaders will need to be involved in every aspect of a business to create the maximum effect and drive the most significant results. Organizations that cultivate Powers of Ten Leaders will experience growth at all levels of their business, by creating structures and processes meant for rapid change. We will see businesses expanding their leaders' abilities in onboarding, training, sales, strategy, technology, and business aspects. The industries that enable Powers of Ten Leaders to thrive will experience the strongest return on their investment, leading to new markets, growth areas and ultimately explosive expansion.

Industry Forecast

Thought Leader: Jerry Walker

Position: Director of IT, St. Louis Treasurer's Department

Area for Disruption: Greater Emphasis on Mental Agility and Innovation

Professional Insight:

“It also allows you to be an innovator by being able to say ‘hey, what else can we find? What else can we do to make things better? Can we pull data in a way to provide it so that it can help police officers figure out some things or make some predictions on crime? Can we take data that says this area has high poverty, high crime, what can we do to boost it where we start pouring money into that neighborhood or area?’ From that point, if we start doing that, we can evaluate whether it really works.

It allows you to be fluid because if you start making decisions and find out that something isn't working, you can make the switch to something else based on the data that you have. Allows you to pivot quickly because you see what is or isn't working really quickly.

Your leadership has to be one that is about change. Change is fun, technology is fun, teams are cross trained, so you have to bring this leadership where you want to promote thought, creativity, diversity. You can't sit up here and say, “hey we have data, what can we find?” and be single-minded because you won't be able to look at the data creatively enough to make the data seem like it works in some type of way. Technology should be easy for anyone to use and for anyone to understand but if your team is narrowly focused, they'll never make it to where it is easy for users to use.”

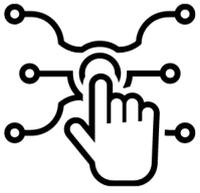
Informational Resources

[Powers of 10 Film](#)

[Strategy V. Tactics](#)

[Think Big, Act Small](#)

[The Effective Executive](#)



Managing Alongside Technology

1 What is it?

As technology continues to become ingrained in our day-to-day work functions, there will be a need for new types of managerial, social, and decision making processes. Managing alongside technology is how we use the different technological tools at our disposal while developing proper infrastructure to ensure organizational health remains high. As new technologies are developed and deployed across industries, the relationship an employee has with their role compared to their organization will change. There may be increased loyalty to the skills and qualification to use a technology rather than towards the organization. Leaders and managers will be challenged with adding emphasis to coordination, control, decision making and execution. There will be a stronger focus on strategic planning as new technologies are developed and workforces adjust to meet new demands.

With technology evolving as rapidly as it is there must be a focus on how we work alongside these systems. This is for the betterment of the organizations in which we work and for the people who work in the organizations. “The point is that the discussions should not focus on humans versus technology; it’s about humans working with technology to solve a problem or unlock an opportunity [72].” 2020 created waves of change regarding how managers approached their roles, specifically due to new technologies acting as intermediaries with employees. There are countless new software that were introduced or expanded upon that have forever changed the way managers lead, counsel, communicate and train their teams. Managing alongside technology is a constantly evolving skill that will enable substantial growth for leaders and organizations alike.

2 How does it work?

Being able to work alongside technology focuses on using technology as a tool to assist us in driving

stronger and faster results with ease. Just as a repairman reaches for a screwdriver or hammer we would do the same with digital tools driving technological innovation. Managing alongside technology will entail working with artificial intelligence (AI) in finding solutions to problems more efficiently so employees can focus on the human aspect of their roles. The technology is a compliment to the workforce, not a replacement to the workforce.

With massive technological shifts in AI, machine learning, and automation, comes a need for our workforces to become increasingly more intelligent. Managers must not only stay educated on the latest technologies, but also know how to best engage their teams while using them. Managers and team leaders must leverage the value of data within their organizations as much as they do with their external relationships. Using data to measure employee success and failure rates, training reports, areas of improvement and ultimately key performance indicators, can better prepare managers who are leading technology diverse teams.

A key component of managing alongside technology is recognizing the true value that you, as a manager bring to your teams, and ultimately to your relationships. New technologies will begin to occupy and achieve tasks that you were previously responsible for, from scheduling and payroll, to report drafting and system updates. Your relationship with your team is the key component that you must be aware of. While technologies are being implemented, you must be able to accomplish what the tech can’t - human connection, empathy, social awareness, advice, and coaching are all areas where your expertise is essential. Understanding that in order to be successful you must recognize technical changes, prioritize your team and leverage data to make informed decisions while being an emotionally intelligent resource that your team can rely on.

3 Who's doing it?

Every organization was forced to manage alongside technology during the pandemic, but now the focus is on which parts of those changes will remain. We were forced to change perspective on how daily operations occurred and how we used technology to assist our lives. We will continue to use telecommunications to meet regardless of location while moving towards using AR and VR platforms to assist us in daily operations. Many companies have already pivoted to address the limitations of social distancing.

Organizations such as Zoom, Microsoft, and Slack have capitalized on the moment to better meet the needs of their teams and are used to drive stronger collaboration. One of the biggest challenges for a manager that must understand various technologies is the friction between them. Fortunately, businesses like Zoom and Microsoft have taken steps to reduce technology friction between their platforms. When large software enterprises recognize the value of shared collaboration and integration, everyone benefits, especially managers and leadership.

4 Why is it significant?

The significance of managing alongside technology is to use technology efficiently while also managing your workforce at a high capacity. We focus more on teaching others how to use technology instead of figuring out a way for technology to replace a person. Leaders and organizations will need to focus on implementing programming and development to focus on how to effectively use technology in that specific field. How can automation be used to focus on the mundane tasks previously done by a human? This could free up those same employees to focus on something of higher value to the organization. How can a robot be used to assist in the physical demands of a skilled laborer and use those employees to focus on logistics instead? In their book *Machine, Platform, Crowd: Harnessing Our Digital Future*, McAfee and Brynjolfsson explore the benefit of the human mind compared to machines stating “we take in an absolutely huge amount of data all the time from our senses, and we don't preselect it; we just take it all in as it comes. We have difficulty trying to hear only certain sounds or see certain things, even for a short

time. Computers are exactly the opposite; they have great difficulty gathering more or different data from what their builders and programmers allowed [73].”

Managing alongside technology presents freedom for the human mind to focus on a more complex set of tasks for businesses. This also brings to the forefront of human vs machine how the human mind can take in what is happening in real-time and use common sense to make decisions. All companies can learn from Uber, “The company's algorithms bumped prices up to encourage more drivers to participate when actual or anticipated car supply was not keeping pace with consumer demand. This practice earned the company bad press when an Iranian cleric took eighteen people hostage at a café in Sydney, Australia, in December of 2014. Many people fled the area of the incident, and some tried to use Uber to do so. Uber's computer systems reacted to this sudden spike in demand by initiating surge pricing [73].” Another aspect of managing alongside technology is the way companies may need to adjust or rethink what technology is being created. What aspects of the business or organization is needing an upgrade and what technology is needed to benefit the employee and therefore benefit the organization. Companies will have to potentially shift gears on what technology is most beneficial and be more innovative in their strategies to create technology.

5 What are the downsides?

One downside to managing alongside technology is using technology to replace employees or team members. Growth and termination are unavoidable, but there is value in reskilling workers to maintain and leverage the technology that now performs their previous role. Managers cannot get too comfortable as new technologies replace their traditional tasks such as payroll, and time tracking. Another downside is when we are working to develop technology, we must ensure that it is properly programmed to work efficiently. On-the-job training and development will have to become a priority for some organizations to successfully work alongside and manage technology.

Organizations must dedicate resources to ensure they don't lose the human connection that drives employee engagement and ultimately success. Simon Sinek's book *Leaders Eat Last* gives us a perspective of how valuable it is to have human connection within an organization stating “The ability of a group of people

to do remarkable things hinges on how well those people pull together as a team. And that doesn't happen in a vacuum [74]." Organizations will need to rethink how collaboration happens within teams while ensuring their employees don't lose the connections that drive success. The implications for leaders who go beyond just figuring out the best way for employees to connect, but also with how they will connect with their employees are enormous.

6 Where is it going?

Managing alongside technology also calls for new jobs to be developed. As technology can be used to enhance our work in many ways this will call for more employees to be able to keep the technology updated and working properly. Managing alongside technology means taking away some of the more mundane aspects of some jobs and creating jobs that focus more on the more complex issues at hand. Managing alongside technology also opens up logistics to a much broader spectrum. Many companies have already been able to use technology to broaden their global reach. Companies have also been able to use technology to use algorithms to better serve their prospective target audience. Algorithms are also being used to help determine the best matches for prospective employees for companies. More data gathered for each interview of a potential employee helps the machine to input those variables and give a better set of skills or questions to ask potential employees. This is a benefit for both the employer and the potential workforce as it gives more data to a process that is typically limited to usable data. Visual heads-up displays have the potential for changing how we operate in our everyday life. Already used by pilots these displays could give information beyond what we can physically see. One use of this technology is already being used in a broader spectrum if you simply watch an NFL game and can "see" where the first down marker is located which is an animation or you see the flight path of a golf ball using a digital tracking system. A visual heads-up display would give more real-time and individually driven information to the user.

Industry Forecast

Thought Leader: Timothy Colwell

Position: Executive Vice President, AOTMP

Area for Disruption: Business Automation

Professional Insight:

"Automating repetitive work using machine learning and bots to replicate mundane tasks accelerates execution and improves accuracy of execution. It changes the composition of workforce skills required to run a business. Automation serves as a catalyst to evolve workforce skills and to accelerate business task execution."

Thought Leader: Matt Bruening

Position: VP of Global Technology Planning, AT&T

Area for Disruption: Speed of Innovation and Collaboration with Technology

Professional Insight:

"I think the ability to share, edit and update common data to work collaboratively on projects or a variety of applications will cause significant disruption. I think what we'll see is that companies can join with others and create new partnerships faster than ever before. We'll see companies in certain industries begin to cherry pick opportunities from other industries.

The shift into the labor market and the speed in which development occurs is increasing because we are in a software driven infrastructure environment. Hardware is becoming, in most cases, more commonly available from ODM (original device manufacturers). The trend is to be more open, and it allows providers to change software over time, which allows for changes in control of a network for faster provisioning for reconfiguration.

The ecosystem, if you will, the technology that supports the disruption is here today.

And so I think it's a flywheel. That is continuing to spin slowly faster over time.

And you'd sort of imagine that there's a certain point where it can't go any faster, and then we'll figure out a way to make it go a little faster still.”

Informational Resources

[Working Alongside Technology](#)
[How Technology is Reshaping the Workplace](#)



Leading at the Pace of Change Amidst High Uncertainty

1 What is it?

Technological innovation and disruption are driving considerable changes across industries, while consumers are experiencing greater flexibility and control over the tools that are available to them. If someone desires to be an effective leader in today's world, they must not only be aware of these changes, but capable of helping their team navigate through the challenges that accompany them. "...the ability to be responsive is a competitive advantage. Those who take fast, meaningful action can assert (or reassert) their authority over circumstances and position themselves to capitalize on emerging needs and trends [75]." This requires leaders who can stay on track and leverage change as a tool rather than an obstacle. Leading amidst high uncertainty requires focus, consistency and the capability to not become overwhelmed with complex changes. The ability to prototype, pivot, and adapt to precarious conditions and ever-changing needs will define the success of future leadership.

2 How does it work?

Being a life-long learner is a key characteristic of a resilient leader. New best practices, technologies, and communication strategies emerge every single day. Once someone reaches a point where they are unwilling to research and understand these new concepts, they become obsolete. Teams depend on leadership to set strong precedents and demonstrate organizational values; continuous learning will be a key value to espouse and uphold. In early 2020, at the beginning of the pandemic, there were roughly 32 million daily users of Microsoft Teams. As of April 2021, that number has jumped to 145 million daily users due to a rise in remote work [76]. What this shows is that over 110 million professionals had to adapt quickly to a rapidly changing landscape that was full of uncertainty. Leaders were in a particularly challenging position, as they were not only learning

new technologies but driving their teams to find success in a unique and volatile territory. Although 2020 brought incredible change, the next decade of advancements will cause disruption at an even larger scale - leaders need to be ready.

What separates good leadership and great leadership, however, is the ability to not only adapt to change, but to find ways to improve your business while enduring it. Many businesses found ways to make remote work something that helped their employees to excel, and actually increased productivity in many cases [77]. This is possible because leaders frame complex situations with humility and decisiveness. If they can frame a difficult change as an opportunity to grow and evolve, their employees will respond proactively, with hope and pride that they have someone to support them. It is imperative that managers and leaders recognize the value of their ability to be resilient while navigating a future of change and uncertainty.

Another key aspect of leading the pace of change amongst high uncertainty is keeping an air of positivity. Uncertainty breeds fear, and with that can come a lack of productivity, discord, slower time-to-market for products, and a desire for a new workplace. A leader's attitude is what others model themselves after. Positivity from leaders has been shown to increase worker satisfaction and productivity, and this remains true when it comes to being positive in the face of adversity [78]. When challenges arise that require a company to quickly shift, it is crucial that a leader is able to tackle these changes with a proactive attitude. Emotionally intelligent leadership should demonstrate that while employees cannot always control the circumstances, they can control their reaction to them; doing so is an important step in empowering teams to know that they are capable of meeting their goals.

A key characteristic of the future leader is flexibility. Leaders who are trying to implement change need to be aware that employees may be resistant at first, and may not respond well initially. While you certainly want to have a plan in place for how the changes will be implemented, refusing to adjust or expecting too much from your team will lead to discomfort and, in some cases, dismissal. Leaders will be faced with challenges to support employees who are resistant to change; approaching these conversations as growth opportunities is essential.

Perhaps the most crucial part of the process, however, is to ensure that you are keeping your goals clearly defined and your team's wellbeing at the forefront of any changes that occur. Especially when there are high levels of uncertainty within a workplace, employees must feel secure in the fact that what originally drew them to a company will still exist after any changes occur. If you are a people-first culture, then you need to be able to illustrate to your team that those values will remain. You also need to keep in mind what you are trying to achieve. Even if the path to getting there is shifting and is heavily altered from your original plan, you must make sure that you and your team are still headed in the same direction. Keeping your employees informed of changes before they take place is critical.

3 Who's doing it?

The businesses that thrive when faced with change are those with leaders who are able to quickly assess, adapt, and spot new consumer needs as they arrive. Jennifer Coy, CEO of Beauty Care Choices, was faced with deciding the future of her business as the state of California entered lockdown. Her approach was ingenious; she recognized that their customers would still need support managing their beauty routines from home. Over the following weeks, she reallocated resources and funds to her e-commerce presence and offered digital experiences to clients [79].

Leaders must always be prepared to implement new strategies to keep up with the needs of their consumers. Freeport-McMoRan, a titan in the mining industry, had to make major changes to its business model spurred by the increase of AI technologies. The company was looking for a way to increase capacity at one of their larger mines, and while their original plan was to expand the mine operations, they quickly realized that they had to pivot. Leadership at

Freeport-McMoRan decided to invest in modern technologies that would improve the efficiency of their existing mines. Some employees were initially resistant to the idea of onboarding AI scientists; however, the leaders stayed optimistic and adamant that this was the change that needed to happen for the company to adapt and thrive in the modern era. Since their change to using an AI-model for the mines, their processing rate is 10% higher than it has ever been and their employees adapted well to the changes [80].

4 Why is it significant?

Finding ways for your team or business to adopt new technologies is going to be increasingly crucial in the next decade. Peter Diamandis, founder of the XPrize Foundation claims that "In the next 10 years, we're going to reinvent every industry on this planet [81]." With this in mind, all leaders have to be prepared to not let these changes slow their teams' progress; rather, they should be prepared to utilize these innovations and developments to elevate their companies. Businesses must be able to constantly adapt to stay relevant in their industries. Even beyond the scope of technology, there will always be some unforeseen obstacle that requires quick change from leadership. Leaders must constantly be prepared to lead their team into uncharted waters with high emotional intelligence, empathy and resilience.

5 What are the downsides?

For many people, change is seen as something extremely frightening and best avoided. Many of those in the workforce feel that it is best to stick to the status quo and not stray too far from traditional practices. This can be true for lower-level employees who do not want to receive new training to long-term board members who feel that the way they found success in the past should be the way things are done permanently. Leaders must be prepared to educate their teams on why the change is necessary, and how the new strategies they plan on implementing will improve the company. This process can become quite time-consuming, and if they come across an employee who is unwilling to keep up with the pace of change, there will inevitably be employment shifts.

6 Where is it going?

In the coming years, smart technology is going to become increasingly necessary in all sectors of business. Businesses that currently leverage smart technology should expect continuous upgrades and improvements. With these improvements will come the challenge of keeping teams trained and confident. A McKinsey Digital study stated that 92% of businesses surveyed felt that with where their company was currently at, they would not be able to stay viable with the rate of digitalization [80]. The need for leaders who can help meet the growing demands of technological utilization is more important than ever. Being able to guide a team through the changes that the market calls for is going to no longer be a desired skill, but a required one. The pace of change will only increase as employees and leaders become more comfortable and confident in their ability to react appropriately. Managers must be proactive in their approach to leading teams through uncertainty.

Industry Forecast

Thought Leader: Dave Skalon

Position: J6 CIO, U.S. Military, Indiana National Guard

Area for Disruption: The Leadership Void

Professional Insight:

“Leadership is a void in America in every sector. We have a working group and committee to achieve anything nowadays. We have to have people with savvy experience and enable them to make decisions without a committee. In IT, people are technical, and they enjoy making things work. This doesn’t necessarily translate into leadership. It’s not their forte. Inversely, if you have a good manager, they don’t know tech. They think it’s all lead, lead, lead. But IT people are unique; you can’t manage them all the same way. Networkers and database engineers are different, so you have to treat them differently. Leadership is an entirely different skill rather than just the next rung on the ladder. I put deep technical people on project teams, so they get their toe in the water of leadership. This gives us a chance to have a conversation and for them to give feedback as to whether or not they like the role.”

Thought Leader: Steve Walker

Position: Chairman & CEO, Walker Information, Inc.

Area for Disruption: Business Transparency

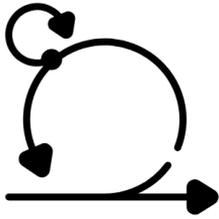
Professional Insight:

“Organizations and leadership need to be more open about the performance of the company and the key drivers of business. [Leaders should] engage as many employees as possible in strategic discussions. Information is so plentiful that if leaders or managers try to hide or manipulate the truth, people will find out, and they will lose trust. Transparency, especially concerning income disparity, will lead to more honest and open discussions about value, performance, and productivity. A transparent free enterprise system will allow ethical companies to be more productive than companies and industries that are heavily regulated. Companies with ethical leadership and management models will offer products that customers are willing and happy to pay for, and will be able to attract and retain more talented employees.”

Informational Resources

[Dealing with Business Uncertainty](#)

[Setting the Pace of Change](#)



Agile Leadership

1 What is it?

Agile leadership, in this context, is more than a specific process or methodology of running an organization; it is a practice and mindset. Agile leaders practice flexibility and adaptability that enable them to evolve the way they manage their teams and lead organizations. Agility is the skill that correlates with the ability to respond, adapt, and manage change amidst market disruption.

Empowerment and engagement of their teams are the core of the agile leader's focus. They seek to leverage relationships built on trust, the innate abilities of each team member to contribute their respective creativity and place extraordinary emphasis on continued learning and development. Because there is an incredible emphasis on responding to change and rapid decision making, flexible leaders must understand how to incorporate data-driven insights into their development processes. Crowdsourcing and absorbing the perspectives within their teams can better inform this decision-making process.

As the business landscape continues to evolve, the need for organizations to remain nimble and proactive in adapting to and leading in change is paramount. An agile leader is more than an authoritarian manager; agile leaders enable their teams to innovate as they embrace a culture of experimentation and co-creation of the company's future. They are tasked with adjusting to client and customer needs while effectively engaging stakeholders to move the organization forward, often serving less as a manager and more as a coach to improve the performance of their teams.

In developing these insights surrounding agile leadership it is evident that, while leadership is traditionally responsible for setting the direction of the organization, agile leadership focuses on creating a transparent environment in which teams can experience greater autonomy and experiment with

solutions to relevant issues. Rapid mobility is hindered in environments where rigid processes serve as impediments for creativity and mass involvement in problem-solving.

Agile leaders leverage technology to empower teams, aiming to put their employees' effectiveness first. As leaders respond to new information, emphasis is also placed on consistently honing in on the team and organizations' core competencies while targeting the problems that are the greatest challenge to these competencies. There is a focus on optimizing workflow, engagement, and resources so that the organization may pivot as disruption transforms the business landscape.

2 How does it work?

Agile leadership is most effective when leaders commit to understanding the intangible, often emotional, drivers of their teams. Effective leadership during times of disruption incorporates the view that their teams operate within an ecosystem that is constantly evolving rather than silos existing to fulfill a company's policies and procedures. To be most attuned to these intangible needs, leaders must develop and incorporate four competencies into their leadership style: the ability to be leaders in the present, self-awareness in managing innovation and creativity, the ability to move and change quickly, and the flexibility to chunk processes.

- **Leading in the Present**
The future means little without effectively addressing the moment. While attention must be paid to developing market trends, organizations avoid friction and free up critical resources as they identify the critical strengths of the organization.

Through understanding the present context of the organization, leadership can identify key external and internal points of consideration. In the external world, leaders can identify top-performing business segments and begin building around strengthening these segments. Internally, leadership can identify what their teams do exceptionally well and have them focus on these key activities more frequently. Leading in the present also represents a leader's ability to be present with their respective teams and stakeholders. Critical details regarding how to best navigate times of uncertainty will be missed if conversations and interactions are not properly tended to.

- Self-Awareness in Managing Innovation and Creativity

Responding to change can lead to reprioritizing metrics that otherwise informed the performance of the organization. As leaders empower their teams to innovate and experiment while also acting aggressively to shore up weaknesses or take advantage of pending opportunities, short-term concessions may be made on the traditional metrics. Depending on the organization, the leader may face varying pressures from supervisors to justify these actions with measurable work. As pressure mounts, leaders must have the self-awareness to understand their emotions in the context of these pressures, ensuring they are properly communicating with their teams and keeping the broader objective in perspective. Additionally, as technologies such as machine learning and artificial intelligence expedite innovation and creativity, leaders must remember that people are at the core of all business processes. The self-awareness to relate to others in times of change will allow teams to develop and maintain trust, leading to greater mobilization of responsive solutions.

- The Ability to Move and Change Quickly

As leaders tap into the expertise of their teams, they must also draw from personal experience when making decisions. As the agile leader continuously learns and pursues knowledge, they must have the ability to act proactively in response to how this knowledge can impact the organization. Whether through cross-functional teams or task forces, leaders should be mindful of their personal board of directors and sources of expertise. A trusted group of advisors leads to sound and informed decision-making. The agile leader strikes a balance in soliciting additional perspectives before making a decision. In creating an environment built on adaptability, leaders must be

willing to act on newer insights while not being impulsive. Moving quickly, with the insight from experts, is a cornerstone of rapidly and successfully adapting to change.

- Flexibility to Chunk Processes

The value of any leader is the ability to see the greater vision for the organization while understanding how to break the vision down into actionable steps. There must be flexibility in how the team is allowed to operate, especially as the era of digital workforces has ensued. Understanding the various and multiple needs of the team results in adapted workflows. Leaders must be willing to identify how to best create teams and collaborate on systems and tools that allow for optimal transparency and communication. Flexibility may also require that leaders fulfill roles needed for teams to move their work forward such as adopting the customer perspective. Flexibility extends into considering how the organization obtains information regarding customers and stakeholders as well as how it makes decisions on how to best continue operations. In providing flexible structure, leaders can develop the infrastructure to sustain the agility required to pivot quickly

It is also important to reiterate that agility is a mindset. This mindset is captured through the lens of serving the customer and is offered by research from MIT Sloan: "To serve [your customers], you need to listen to them to find out how their needs are evolving and how you can help. Just as building connections with other key stakeholders takes time and energy, this isn't done by fielding surveys; it's about having conversations [82]." MIT Sloan Agile leadership works when leaders focus on creating high functioning teams that meet the relevant needs of the market while remaining privy to how those needs may change.

3 Who's doing it?

Flexible leadership practices that offer maximum agility are harnessed by companies in all sectors from technology, insurance, banks, retail, and pharmaceutical companies.

While the COVID-19 pandemic caused many companies to rapidly adapt processes and procedures, these adaptations will likely persist. The agile leadership responsible for these rapid adaptations has

demonstrated that organizations need not only adapt to survive but can reasonably expect to thrive. As highlighted in a McKinsey report, a telecommunications company developed a rollout plan focused on a robust training program for 25 new cross-functional teams. The pre-pandemic expansion plans accounted for budgetary and objective-based guidelines for each team which were quickly altered to meet the evolving demands of the COVID-19 marketplace. Budgetary confinements ensued yet did not derail the rollout of the cross-functional team expansion. Rather than retract operations altogether, the organization utilized these budgetary confinements as an opportunity to better understand their value added.

As the company examined their core strengths, they decided to build teams around delivery of those central competencies, realizing that they had initially built teams to service segments not as fundamental to the organization's success. It is noted that this practice should extend to individuals to capitalize on each person's strength rather than confining individuals to silos or strict business units. This practice requires prioritizing the need to engage teammates rather than prioritizing conformity to management-determined initiatives.

In addition to clarifying the business objectives among the teams, the telecommunications company virtualized the training program set to launch these teams. While virtual meeting platforms allow for specified breakout rooms, this company's example reminds leaders that merely substituting the standard in-person meeting for a virtual meeting does not necessarily lead to optimization of the training. The telecommunications company created an interactive breakout room guide which would allow the individuals to navigate the rooms according to their priorities. "Coaches" were assigned to maintain event timing, run the breakout sessions, and recreate key sessions on a smaller scale. Through interdependent leadership and reimagining standard processes, the facilitation of the 250+ member event allowed the company to progress in its efforts.

An apparel store highlighted within the same report leveraged the power of flexible leadership as they allowed similar breakout teams to take ownership of creating functional team guidelines. The protocols established within the team regarding accountability and performance measures were resonant, giving the teams a level of autonomy and accountability that would be absent with external controls applied.

The retail organization also created the ability to visualize workflow data that was visible throughout the organization. Transparency allowed managers to understand where each team was on their productivity path, enabling assistance from other team members and cross-functional communication to reach deadlines [83].

While leadership approaches to work vary from industry, understanding the strengths of the organization and its people enable leadership to create paradigms that allow their organizations to identify and solve their most relevant problems in a customized way.

4 Why is it significant?

A recent study by Forbes found that "the least agile employees rated at the 8th percentile on their overall effectiveness, but those who were the most agile rated at the 89th percentile! Being agile is directly connected to an individual's overall effectiveness [84]." In the face of constant change, and flexibility, agility means the difference between longevity and failure. As the pandemic revolutionized the economy by necessitating digital commerce, companies such as PepsiCo pivoted to direct-to-consumer models outside of traditional retail.

In fact, PepsiCo launched Snacks.com and PantyShop.com in 2020, months after the pandemic forced a global lockdown. Per Salesforce's 360 blog "What was most striking about PepsiCo's foray into direct-to-consumer (D2C) commerce and marketing was its speed. 'We went from concept to launch in 30 days,' said Mike Scafidi, PepsiCo's Global Head of Marketing Technology and AdTech. 'Within 30 days, we stood up our ecommerce capabilities and started delivering directly to our consumers [85].'"

The rapid transition into digital commerce is representative of the power of agile, and resilient leadership. As shared by PepsiCo CEO Ramon Laguarta via MarketingWeek "the resilience and agility of our teams across every continent demonstrates our ability to support our customers and communities during their time of need while also delivering good results for our shareholders [86]."

This example demonstrates the importance of remaining agile and responsive to persistent changes

in market conditions. Whether inspired by the pandemic or industry-specific transformations, individuals should look to their operating foundation of resilience and adaptability. Organizations should enable leaders to become and remain agile. The example of PepsiCO illustrates the significance of agile leadership as these practices directly affected the bottom-line. As MarketingWeek further provides “for the third quarter ending 5 September [2020], sales of snacks in its North America unit rose 7%, while higher demand for breakfast foods led to a 6% rise at its Quaker Foods business [86].” This increase came a quarter after PepsiCo’s declined 7% as the pandemic began. The downward trend was stemmed due to the agility and resilience of the organization.

The focus on agility and resilience provides opportunities beyond a more engaged workforce. As shown with PepsiCo, agile leadership affects the fundamental operations that determine whether a company will remain relevant amidst disruption.

5 What are the downsides?

As leaders look to persist in developing a culture of innovation and creativity, they also run the risk of facing criticism. While criticism may not be a novel occurrence to many leaders, the ability to adapt to changing customer needs and the needs of the team require a high level of mental alertness. While experimentation efforts do not always yield immediate results for the bottom line, leaders may face pressure that directly challenges their willingness to continue with innovation efforts or unconventional ways of thinking.

Success in agile leadership also requires trust, transparency, and a degree of unity and emotional connection. The agile leader must consider their capacity to communicate with individuals in a relevant way. Harnessing a sense of unity and team enablement requires a culture that allows for psychological safety and the ability to share concerns and ideas. Management must consider its capacity to cultivate this culture of trust and respect.

The development processes that traditionally rely on automation of procedures may not currently contain the infrastructure to implement these practices. Varying degrees of effort may need to be applied in order to adapt current systems for optimization of

chunking longer project cycles while simultaneously harnessing real-time data to influence decisions. In this way, nimbleness may extend beyond the individual itself and into a business’ processes. The change starts at the individual level.

Lastly, failure to consider the effects of the work environment and the various needs of each team member can be detrimental to their engagement and overall success. As leaders look to optimize engagement, they must also be mindful of the pitfalls related to not providing ample organizational structure. Unifying the team requires clear guidelines, objectives, and clarity of leadership. While agile leadership may allow interdependent and tiered levels of leadership, having a coaching mentality that operates within the clearly defined organizational guidelines can help to ensure that leaders are maximizing their team’s talent while enabling autonomy and ownership.

6 Where is it going?

The agility of leaders creates the foundation for success amidst disruption. The C-Suite alone cannot make every change needed in navigating transformation hence the emphasis on developing agile leaders within cross-functional teams. Through this enablement, companies can have tiered leadership that may quickly respond to changes and respond to evolving customer feedback loops.

These changes require a holistic mindset shift in both managers and employees. Especially as remote work becomes more prevalent, leaders will have to quickly adapt to the needs of their people. Leaders will also have to commit to learn and adopt new skill sets and mindsets on an individual level. The skill set of the agile leader embraces feedback and iterative approaches to project lifecycles while remaining aware of employee needs and engagement. As seen in the PepsiCo example, transformation can be expedited through investing in understanding where the main drivers of the organization lie. Management must remain agile in its ability to shift not only how they relate to employees, stakeholders, and customers but to how they perform business functions. Adopting new business practices altogether, such as PepsiCo’s digital transformation, will be crucial to thriving in disruption. Understanding the key business drivers will allow leaders to predict where developing technologies can be implemented and where they can be

revisited for future consideration.

Rather than a command-and-control driven environment, flexible leadership requires the ability to outsource to your team while cultivating accountability and responsibility for results. Micromanagement does not successfully translate to the remote environment therefore leaders have to change the way they lead in order to maximize engagement of remote employees.

In addition to how people work, leaders must remain flexible when employees work as well. As boundaries and old paradigms regarding the traditional workday and location begin to fade, leaders must consider the individual needs of each of their teammates and enable their employees to optimize their work schedule around their lives. “Great leaders unleash the talents of their people rather than try to harness them [87].”

The future relevance of an organization depends on the adoption of agility and flexibility at every level of the organization.

Industry Forecast

Thought Leader: Becky Klein

Position: Assistant Director, Drake University

Area for Disruption: Future Large-Scale Global Emergencies

Professional Insight:

“The COVID-19 pandemic has shown how ill prepared most institutions were to respond to a global threat. This was the first pandemic of its kind, and scientific experts have advised that it won’t be the last. Institutions need to be more agile and flexible as far as how they conduct business and allow employees to work. This disruptor will continue to be unpredictable and impact operations in every industry. Companies need to have safety measures in place to prevent infection spread, and offer improved work from home measures to allow employees to continue working while maintaining safety. Production companies also need to evaluate the products they produce and market to appeal to the changing needs of those who will be at home a great deal more.”

Industry Forecast

Thought Leader: Chris Allen

Position: Professional Services Manager, Genesys

Area for Disruption: Agile Leadership and Business Implementation

Professional Insight:

“The ability to be multi-threaded and change direction at any given point during a project will change how Professional Services delivers anything. From the front line engineer and all the way to the VP on how things will operate. Ideally projects will be delivered faster and more consistently. Time-to-value will be the key metric around this disruptor.”

Informational Resources

[Planned Opportunism](#)

[Leading Agile Transformation](#)

THE CICS 2021 HORIZON REPORT:

BUSINESS MODEL TRENDS THAT WILL SHAPE THE NEXT DECADE

Dr. Dennis A. Trinkle

Cyrus Green, Christopher Nouhan, Paul Faria

**Center for Information and
Communication Sciences**



**BALL STATE
UNIVERSITY**

Center for Information and
Communication Sciences

An Introduction - Future Disruption

The Covid Pandemic has upended many technology, business, and leadership trends while accelerating and adding new urgency to others. The interplay of this disruption and acceleration is highly evident in the 2021 Horizon Report. To capture and represent this dynamic environment, this year's report takes both a wide-angle and telescopic approach to identifying the major trends in technology, business practices, and leadership practices that will drive and reshape organizations over the coming decade. Through detailed surveys, interviews, and supporting research the Center for Information and Communication Sciences research team looked at current significant trends across all sectors, zooming in to look at current states, zooming out to look at developments anticipated to emerge further out on the time horizon, and widening the long-term lens to identify and describe the synergistic effect the individual trends will have in varied combination. What we discovered is an unprecedentedly rich period of innovation across all sectors and categories. While it is difficult to anticipate clearly the ultimate outcomes of the trends identified here, we hope the trends and direction arrows identified below will help organizational leaders at all levels to better anticipate, plan, build and innovate.

Methodology

To identify the key trends identified in the Horizon Report, the research team relied upon expert surveys with more than 100 thought-leaders and top executives across diverse corporate, government, and non-profit sectors. Over 50 thought leaders participated in detailed interviews and follow-up conversations to add breadth, depth, and nuance to the analysis. These expert forecasts were supplemented with research across current literature and findings from related studies. The results represented here are based on this combined research and reflect the input of the many experts who contributed to the analysis. We are grateful to each of them for sharing their time, experience, and expertise.



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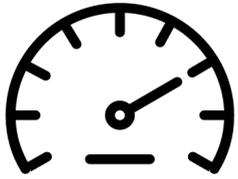
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Rapid and Accelerating Pace and Amount of Change

1 What is it?

The acceleration, scope, scale and economic impact of technology is driving significant changes to every aspect of our lives. Our respondents indicated that the pace and amount of change has accelerated and will continue to do so in the coming decade and beyond. Time to market for many products and applications has never been faster. Consumers are actively engaging with new software and technologies nearly as fast as they are being developed. The difference today, compared to previous years, is the sheer ubiquity of technology that has been integrated into our lives. As we compare the pace of change today to some of the most impactful inventions of the last 20 years, we can see how long it has taken each major item to be used by 50 million people [88].

- Within 14 years, 50 million people were using computers.
- Within 12 years, 50 million people were using mobile phones.
- Within 7 years, 50 million people were using the Internet.
- Within 3 years, 50 million people were using Facebook.
- Within 19 days, 50 million people were playing Pokemon Go.

As companies continue to innovate and release new products, consumers will be there to use them at a much higher rate than we've ever seen. We are living in a time where the pace of change is accelerating, rapidly. This change also transcends the idea of a target market. Your customer today may be different than what it was 5 years ago, or even 1 year ago. McKinsey estimates that change is happening ten times faster and at 300 times the scale of the Industrial Revolution, resulting in roughly 3,000 times the impact [89]. The culture of your organization and your workforce demographics are changing at an incredible pace, as outlined in prior sections. Recognizing this pace of change will enable business

leaders to not only avoid negative impacts, but leverage this disruption to drive higher growth margins.

2 How does it work?

Accelerated adoption drives accelerated innovation. Businesses are constantly producing new and improved versions of products, applications, and software, which keeps market competition high and encourages more product innovation. According to a new McKinsey Global Survey of executives, “companies have accelerated the digitization of their customer and supply-chain interactions and of their internal operations by three to four years. And the share of digital or digitally enabled products in their portfolios has accelerated by a shocking seven years” [90]. Digital transformation has been a large driving force behind many of the changes we are experiencing.

The number of global users actively engaging and leveraging the internet is estimated to have risen from 29.3% in 2010 to 53.6% in 2019, with global IP data flows growing from 100 gigabytes per second in 2002 to 88,000 gigabytes per second in early 2020 [91]. Covid-19 exacerbated this trend by forcing nearly every industry to digitize or die. As more businesses and consumers transitioned to online-only commerce, the share of global retail trade from e-commerce went from 14% in 2019 to 17% in 2020 [92]. With increased consumer demand for digitally accessible products and applications, businesses need to ensure they are well prepared for rapid digital changes.

Technology advancements are allowing entrepreneurs and small businesses to gain scale with very little capital, causing shifts in competitive markets. The traditional life cycle of organizing and starting a business is much shorter, allowing a faster concept-to-market timeline for products. Executives

of larger companies are now challenged with making decisions faster and committing resources at a higher pace due to smaller companies having advantages over established businesses. Access to information and the proliferation of technology-enabled companies has skyrocketed, creating avenues for emerging economies to scale at unprecedented speeds that would not have been possible two decades ago.

3 Who's doing it?

Agility is a core competency that is prevalent in any business successfully navigating the rapid pace of change we are experiencing. Agility in communication, customer needs, and organizational structure leads to businesses being ready and able to adjust rapidly.

Amazon is a perfect example of an agile business, not only because they are one of the largest companies in the world, but because they have one of the largest customer bases in the world. Amazon has led innovation and grown rapidly due to adapting an opportunity mindset: “think longer term, obsess over the customer, and be willing to invent” [93]. These maxims are cornerstones that every employee at Amazon is exposed to and expected to leverage. Being agile is rooted in being aware of where you currently are and where you could be. Amazon also leverages customer insights, so they are constantly aware of where their market lies and how they have to pivot to meet it.

Another organization that has not only responded well to change, but positioned themselves well to succeed as an industry disruptor, is Uber. Uber identified a market gap in the taxi industry and forever changed the way consumers use public and private transportation. They identified all of the things that customers hate about riding in a taxi and built their company around it. Customers waiting for their taxi were now provided a visualization tool to see where their driver is. They created a cashless service to prevent fare dodgers and improve driver safety. Ratings for drivers encouraged them to be customer-centric, while enabling customers to choose the highest rated option. Uber disrupted the industry and continues to leverage an agile mindset as they respond to new shifts and changes in ridesharing.

4 Why is it significant?

Understanding the rapid and accelerating pace of change that is occurring is essential for continued business success. Consumers are expecting more from companies socially and environmentally while demanding new products be consistently released, updated, and improved. To survive and thrive in this complex and volatile environment, businesses will need to leverage agility at scale.

Additionally, as changes become more frequent, businesses who aren't able to pivot or adjust will suffer. McKinsey has identified the importance of making this transformation as a business, not simply as executives and managers. Business models may shift and it will take the entire organization working together to find success. Additionally, companies should choose specific business areas that are the most important to demonstrate a successful transformation. Creating a sustainable operating model that can adapt to rapid change is essential. Organizations must prioritize their people over the process to create a strong cultural buy-in and to engage their best leaders during a transformation.

5 What are the downsides?

Businesses and leaders who struggle to adapt to rapid changes will ultimately fail as disruption will continue in this space. Technological innovation will continue to drive larger gaps between businesses that can afford to optimize and those that can't. A Dell study identifies that “Only 27 percent [of businesses] have ingrained digital in all they do. The majority (57 percent) of businesses are struggling to keep up with the pace of change and 93 percent are battling some form of barrier to becoming a successful digital business in 2030 and beyond” [94]. We can expect that businesses who aren't digitized will likely fail by 2030, if not sooner. Additionally, some organizations may fail in adapting to an agile culture that enables them to successfully pivot when large disruption is looming, causing job loss, industry and market fluctuation, and massive shifts in wealth.

6 Where is it going?

As digital transformation continues and the pace and amount of change increases, emerging technologies will drive new partnerships in automation and robotics, shifts in how businesses are developed and organized, and full scale digitization across industries. Companies will likely become more lean and agile, focusing on sustained output while leveraging digital tools to efficiently improve their operations and processes. Industry leaders in automation and robotics will emerge, driving shifts in traditionally human-oriented processes and causing businesses to replace employees with machines or create structures that expand capabilities for partnerships.

Technology leaders are still planning how they will respond to future shifts, knowing that their employees, products, and consumer bases will change as competition drives innovation. Change and transformation have always been on the horizon, but never to the scale or the opportunity that we are experiencing today. The digital age is quickly turning into the age of digitization, and those who fail to adapt to change will be left behind.

Industry Forecast

Thought Leader: Matt Bruening

Position: VP of Global Technology Planning, AT&T

Area for Disruption: How frequently professionals will realign themselves and change company or other affiliation

Professional Insight:

“You could almost imagine a marketplace. Setting aside benefits and other considerations that caused individuals to want to affiliate with a company for a long period of time. But beyond that, if there was a fair and equitable marketplace to advertise one’s skills, and you’re able to work remotely and collaborate and join new teams, new projects and disengage with old ones. I would imagine a workforce that becomes much more independent and nomadic, maybe even geographically nomadic.

I could see an application on travel and international relocations, things like that, but an environment where individuals are able to change based on a project level.”

Informational Resources

[Addressing Organizational Pace of Change](#)

[Enterprise Agility](#)

[Optimism of the Future, not Fear](#)



Global Economic Shifts

1 What is it?

The global landscape, both politically and economically, has dramatically changed due to Covid-19. There have been shifts in globalization, uneven Covid economic recovery, shifting markets due to an increase in global commerce, a new generation of entrepreneurs, and supply chain and trade developments [95]. This section will focus on global economic shifts and how political structures will influence them.

There will continue to be uneven economic recovery from Covid-19. The United States and other developed countries have mostly re-opened and have seen commerce surges in nearly every industry. Differences in vaccination rates, size of stimulus support, and control of new infections has created significant imbalances on a global scale. Businesses must be aware of this as they decide which consumers to market their products and services to while developing informed pricing and value strategies.

Globalization shifts will continue to produce uncertainty as supply chains are still recovering from Covid-19. Additionally, geopolitical uncertainties fueled by a rise of nationalism has driven some businesses to relocate their manufacturing plants. On the consumer front, customers are demanding transparency and ethical boundaries in how products are sourced and shipped.

High degrees of digital commerce will drive international shifts in how products are marketed to different groups of consumers. This will also be impacted as markets shifting to emerging economies in Africa and the Middle East continue to drive global economic growth. The Asian Pacific will remain the most attractive market for business as more companies tap into emerging economies like Indonesia and the Philippines.

Additionally, many countries will experience a new

generation of younger entrepreneurs that have a greater influence on global commerce. As digitization increases, the use of cutting-edge technologies will enable disruptive spaces for entrepreneurs to occupy at a global scale.

2 How does it work?

Commerce surges and economic rebounds are expected for developed countries that have lifted their Covid-19 restrictions. This is impacting different regions and communities differently; Chinese consumers, for example, are acting and spending nearly as much as they were pre-crisis. Companies must be intentional in how they market and advertise their products to communities and regions that are still largely unable to re-open. Businesses will appear tone-deaf and their values questioned if they are actively marketing to groups still heavily impacted by the pandemic.

Many businesses that operate internationally were required to adjust their travel policies during the pandemic. Many of them are still identifying if travel is necessary anymore. After a recession, business travel historically takes longer than leisure travel to return to normal levels [96]. It is expected that regional and domestic travel will return, but many are still unsure as to what extent. As businesses continue to navigate this landscape, travel and hiring processes will be impacted by their international strategy and objectives.

Additionally, we are witnessing the end of a surge of new businesses and young entrepreneurs across major economies, including the United States, France, Germany, and the United Kingdom [96]. The larger scale impact of workers starting their own business is the effects that it may have on economic recovery

and general job health. Digitization has revolutionized an array of business practices enabling one-person companies to operate at a capacity similar to that of a traditional multi-member team.

Covid-19 accelerated digital shopping and e-commerce to unprecedented heights, revolutionizing automation factors and enabling substantial shifts in global commerce. Online retail shopping will remain at pandemic levels as consumers are used to and, in some cases, more comfortable ordering products from their home. The penetration of e-commerce across global economies was significantly higher than predicted: “In the United States, the penetration of e-commerce was forecast in 2019 to reach 24 percent by 2024; by July 2020, it had hit 33 percent of total retail sales. To put it another way, the first half of 2020 saw an increase in e-commerce equivalent to that of the previous ten years. In Latin America, where the payments and delivery infrastructure isn’t as strong, e-commerce use doubled from 5 to 10 percent. In Europe, overall digital adoption is almost universal (95 percent), compared with 81 percent at the start of the pandemic” [96]. As consumers stay active online, businesses and brands will continue to fight for screen time and data as these two components become currency.

We will also experience shifting market frontiers that will appear in the Middle East and Africa. As economic power shifts to emerging markets, companies and organizations will be vying for market control and will make large investments to secure their consumer foothold. These emerging economies will “remain the principal drivers of global economic growth in the long term. Between 2020 and 2040, 75% of the global GDP growth will come from emerging and developing markets, bringing up their share in the global economy in purchasing power parity (PPP) terms to 69% by 2040 (up from 56% in 2020)” [95]. Global businesses will target new middle-class growth in and around the Middle-East and Africa to gain market superiority.

3 Who’s doing it?

As the United States finds its international footing and re-emerges from Covid-19 as a global player, we will see disruption from foreign powers. The decoupling of the US-Chinese tech sector has already had massive ramifications in the flow of tech components, talent, and resources. The semiconductor

battle will continue to be leveraged geopolitically as new technologies like 5G and cloud computing grow in influence. Time predicts that “This trend will affect not just the \$5 trillion global tech sector, but other industries and institutions, as well. This will create a deepening business, economic, and cultural divide that will risk becoming permanent, casting a deep geopolitical chill over global business. The big question: Where will the Virtual Berlin Wall stand” [97]? We can expect the relationship between the United States and China to remain fluid as each side vies for technological and economic superiority. Global antitrust regulators will continue to have an impact on Europe and North American tech giants, while trade tariffs will become more assertive. Multinational companies will be navigating higher regulations if they conduct business in multiple global regions.

The cost of pollution is continuing to wreak havoc on global ecosystems. International superpowers are taking massive strides and investing in green energy at unprecedented rates. This investment will have positive impacts not only on their economies, but also on a global scale. The following plans were compiled by the McKinsey Report [96]:

- In September 2020, China pledged to reduce its net carbon emissions to zero by 2060.
- Japan has pledged to be carbon neutral by 2050.
- South Korea’s Green New Deal, part of its economic-recovery plan, invests in greener infrastructure and technology, with the stated goal of net-zero emissions by 2050.
- Nigeria plans to phase out fossil-fuel subsidies and to install solar-power systems for an estimated 25 million people.
- Colombia is planting 180 million trees.

Green initiatives provide substantial economic growth opportunities for many industries. The imperative for business leaders is based on sustainability concerns from investors and consumers as public opinion and transparency are becoming increasingly important to users. Additionally, Covid-19 presented a glimpse of a future that could resemble that of a climate crisis: global, systemic, and rapid change at an unprecedented rate.

4 Why is it significant?

Understanding the current and future state of global economies is critical to ensure businesses and leaders are prepared to respond effectively. Organizations that employ a global or multinational workforce are particularly impacted at the employee level. Additionally, as sanctions and trade disputes continue, the impacts are felt globally.

5 What are the downsides?

Patterns of de-globalization are increasing while nationalism is surging across developing nations. Although the Biden administration has made efforts to rekindle shattered international relationships, many fear that the next administration will make similar strides in the opposite direction. As global economic shifts continue, some nations will adopt a nation-first mentality, causing governments to invest their resources internally. This historically leads to outsiders, migrants, and foreigners being seen as economic burdens [98]. As cases of Covid-19 persist in every country on Earth, governments are pressured to make their own citizens a priority, which will continue to exacerbate the barrier-to-entry for poorer and less developed countries to get vaccine access. Vaccine nationalism could slow global economic recovery, costing high-income countries around \$119 billion per year until a full global recovery is secured [99]. In contrast, the cost of supplying low-income countries with vaccines has been estimated at around \$25 billion. Private companies may be in a position to advocate and leverage their expertise and influence on governments to push for increased international vaccine deployment.

6 Where is it going?

As we look to the future development of the global economy, there are a range of predictions and looming threats that will have lasting, generational impacts. The negative effects of climate change are going to drive a multinational response that will take form out of necessity. Although there are currently global agreements in place to combat the effects of climate change, many less developed nations are

running out of time. Business and commerce will forever be changed in some geographies due to climate change. Private enterprise will likely be a deciding force in how national governments respond to advocacy groups calling for environmental action.

Future employees from younger generations will demand that companies reflect humanitarian values, leading companies to invest and advocate at a higher rate. Businesses will be held accountable and will feel pressure from their customers and employees alike. As the power of social media reaches new heights and businesses recognize the value of aligning with those demanding action, there will be substantial change.

Industry Forecast

Thought Leader: John Pistole

Position: President, Anderson University

Area for Disruption: U.S. Standing in the World

Professional Insight:

“Power, prestige, and patronage of the U.S. abroad, after four years of disengagement and decreased influence. As the U.S. has taken a step back, other powers have stepped in to fill that vacuum. It will take several years for the U.S. to change its international standing.”

Informational Resources

[Global Forces Breaking Trends](#)

[Trends Shaping the Global Economy](#)



Business Model Changes

1 What is it?

While products and services are continuously changing as technology evolves, CICS has identified that the companies that develop and offer these products are changing just as rapidly. In addition to technological advances allowing businesses of all sizes to operate more efficiently, technology is also forcing them to think about how they generate profit. The how behind a business' customer facing operations is known as its business model. CICS defines a business model as a framework a business uses to design, plan, and implement its strategy for delivering value to customers and receiving compensation for the delivered value. Business models define how organizations maintain revenue streams and customer relationships. Furthermore, they outline the business' value proposition. Business models are utilized by companies at all stages and are fundamental to daily operations. Technology is creating a shift in how businesses render services, manage and prioritize customer relationships, and how to optimize for continued success in three major ways.

First, many companies of all sizes across all sectors are moving to a subscription-based model where repeat business is driven by a relationship and not long-term contracts with the customer.

Second, there is a greater emphasis on frictionless sales processes. The sales cycle has shifted from one where a customer is handed off to multiple specialists into a cycle that empowers the customer through self-service tools and seamless automation.

Third is the prevalence of data-driven decision making within organizations. As compute resources have become more accessible, larger volumes of data surrounding customer behaviors and nuanced preferences are available for organizations to collect, store, and analyze. The results of their findings enable decisions that produce a greater sense of intimacy and understanding of their customer needs.

2 How does it work?

Subscription-based models create a fundamental shift from product-oriented processes to customer-centric processes. In other words, the focus shifts from optimizing business functions primarily for product development into driving decisions derived from customer usage and insights. Where the subscription-based model was once reserved for entertainment companies, businesses within automotive, hospitality, software, and government are also making this shift. The most obvious example of this is with the Adobe Creative Cloud platform. As recently as 2013, a customer of Adobe Creative Suite products would spend \$1,300-\$2,600 for a perpetual license. The customer would purchase the license to the software and own it indefinitely. While upgrades would be slow and costly, the customer retained the decision to stay with the outdated version and eliminate recurring costs or upgrade. For the customer, there are pros and cons to this model.

- Pros: you pay as you go, avoiding large upfront costs. You get access to frequent updates and software support. You may cancel at any time with no cancellation fees or penalties (other than lost access to the software).
- Cons: it is a recurring bill that will eventually exceed the cost of an up-front purchase. The customer continuously pays for the service incurring monthly or yearly overhead.

While the service offerings a company provides remain a crucial lynchpin for success, how they sell those services is becoming increasingly important. Each specialist, step, or hurdle in the buying process creates friction for the customer. Higher friction is resulting in increased dissatisfaction. As dissatisfaction is linked to customer loyalty, organizations must make process changes that allow the sales of their products to be as seamless of an experience as possible.

Customer-provided data is driving an enhanced user experience. In the case of Netflix, there is data regarding which shows their customers are skipping through, which genres they prefer watching, and how long they watch different forms of content. With these insights into the user's preferences, Netflix can make more successful recommendations to subscribers. This process keeps customers engaged because they get what they want, and ultimately makes Netflix more efficient because it can develop more targeted products.

3 Who's doing it?

We are seeing these trends across all industries. Software has demonstrated this in its subscription-based offerings. Tesla, for example, is offering its Full-Self Driving feature as a subscription to their vehicles. Nio, Inc. manufactures electric vehicles with swappable batteries in what it touts as Batteries-as-a-Service. Video games are escaping the confines of their plastic cases and CD-ROMS and migrating to cloud-based platforms that enable on-demand downloads and updates. While many still purchase individual songs and albums of their favorite musicians, the trend toward subscription-based music is dominating the consumption of music and audio. From Spotify to Disney+, companies across every industry and sector are moving toward subscription as a service.

Kerry Sims at Hitachi Vantara has made light of their Trains as a Service model which has shifted its source of revenue from whole selling trains in the government sector to subscription-based purchases where Hitachi provides predictive full-service on the trains. The client (in this case, the government) simply needs to focus on staffing the train, rather than worry about purchasing the train and conducting any maintenance associated with it. Now, Hitachi equips trains with sensors allowing them to run diagnostics on the train and predict when it will need maintenance. In exchange for the recurring fee, Hitachi absorbs the responsibility for the performance of its product. This incentivizes its clients to value elements of their agreement beyond the product itself. Service and frequent updates to its product are several value-adds to the subscription model that entice the retainment of customers. To execute this model, however, large amounts of data are necessary to store and compute the measures received from the trains. This requires an organizational shift that

prioritizes and more efficiently harnesses insights derived from data.

4 Why is it significant?

A shift to subscription models is significant because it transforms traditional profit strategies. The company acquires the risk that a customer may cancel their relationship at any time, potentially cutting off the continuous source of revenue. Because this model is customer-centric, companies must optimize business processes to meet the customers' expectations and desires. This ensures that customer needs are being factored into design and implementation decisions. Because customer needs may change extremely quickly, organizations functioning in the service-based model must be able to collaborate efficiently and adapt to shifts in the marketplace. This has accelerated the need for "flatter" organizations and reduced hierarchical structures. "The basic idea behind a services operating model is that it is composed of a number of self-organizing, collaborative components—"services"—that together execute the sum total of a company's business activities. Services are self-contained sub-organizational units, each of which can be managed independently or, in certain cases, outsourced from the parent organization" [100].

This presents a significant shift from an employee and business operations perspective. "Flat" organizations allow employees to take responsibility for projects and decision-making. Rather than funnel decisions, ideas, and requests through a supervisor or series of supervisors, self-sustaining teams contain the ability to make decisions within the greater context of the organization. While this allows for greater productivity, businesses run the risk of over-generalization and slow progress if there aren't clear goals and policies that provide a unified foundation for these teams. Rather than attempt to transplant an old approach onto new tactics, leadership must be willing to alter its paradigm of traditional monitor and control principles if the flat or agile framework approach is to work. It is in this iterative environment that organizations can begin to optimize their processes for ultimate customer satisfaction.

Automating and enabling technology to carry customers through a self-service style process

(like making an online purchase) reduces friction and increases efficiency. We are seeing priorities shift towards optimizing a customer's efficiency through the sales process rather than optimizing front-line employees and their ability to guide the customer through the sales process. Customers are preferring intuitive, quick, and easy purchase processes unencumbered by unnecessary steps or delays. This creates a shift in the landscape for businesses and employees alike.

Employees must make the shift from specialization into developing "T" shaped competencies. They must be able to understand the basics and be able to contribute to many facets within the organization. This may require reskilling and development outside of traditionally siloed skill sets. As humans are able to step away from friction-generating activities, they are able to make greater contributions to the user experience. They can be reallocated to real-time support via social media platforms or online chats and spend more time on user experience design and research.

Companies must adapt to an emerging landscape in which customers care just as much about the simplicity, intuitiveness, and pleasurability of their purchase experience as they do about the quality of the product. Companies may consider whether they need an additional sales member, or if there are automated solutions that create greater value for the customer experience.

In addition, understanding the difference between what the business needs to operate efficiently and the value it adds in the marketplace is critical. There is a clear difference between optimizing backend payroll services and improving products. Leveraging your technology so that backend, core processes such as payroll are efficient frees up employees to focus on value-driving activities. There is less forgiveness in the marketplace for slow, cumbersome transactions, especially where technology can enable and empower people to do it themselves. Does the customer need to haggle with salespeople, or can they make their purchase online with a few clicks of a button while having shipping and delivery methods sorted out in minutes? Is it easy to return the product or troubleshoot the product, should there be any issues? Is it clear how these issues are resolved? Again, optimizing for the customer-centric approach may change how an organization prioritizes communication.

In order to optimize this efficiency, companies must have clearly defined metrics and their necessary data

points to gauge how well customers are navigating their sales process, as well as to be able to receive and implement feedback as future iterations of the sales process look to become more efficient. It is in this way that we are seeing organizations move toward a more data-driven, customer-centric approach.

5 What are the downsides?

Organizations may not have the infrastructure and leadership at all levels currently in place to accommodate data-driven and agile processes. Additional training may be required for employees to competently adopt new or multiple roles within the company. Many of these roles may need to be reimagined within the context of increasing customer value. Changes in revenue streams may massively disrupt how a business tracks profits, bills customers, and how it prices other services in relation to the as-a-service offering.

This can be a radical shift, and may require a new paradigm for managing and leading the organization. The organization must consider whether it can handle greater collaboration with employees in lieu of typical hierarchical structures. Additionally, the various service segments and teams may need to adjust to self-management practices. They will need to recalibrate on how to best ensure that each sub-team is following certain protocols and procedures. There may be challenges in consistency with the product and challenges in the teams' understanding proper communication channels and escalations. The organization will need to consider if they have the correct leadership in place to foster this transition.

Policies and incentives may also need to be reviewed to ensure that incentives in pay align with delivering optimal service to customers. As the fundamental mindset overhauls continue, information technology departments will need to be fully integrated into the organization rather than seen as a separate silo. Ensuring that computing resources are properly funded may present challenges if the company does not have a strong data center architecture of some kind already in place, significantly increasing capital expenditures.

In an agile environment, disengaged factions can severely disrupt seamless functioning within the

organization. As the business obtains real-time customer feedback and insight, it must be able to act on solutions. Again, the business will need employees with the flexibility and versatility necessary to understand who to collaborate with to ensure the timely delivery of said solutions.

If leadership is fixed in its approach, it may not be able to adapt to changes necessary to support subscription-based services.

6 Where is it going?

More than products being optimized for their use, customers are prioritizing purchase experience as a major factor in determining loyalty and repeat business. The implications of this experience-oriented trend is demanding that companies are able to react to new insights and feedback more quickly. Companies must be agile and collaborative, as clunky internal processes will delay critical product and service progress. The shift to frictionless as-a-service models is a creative endeavor. In the example of Hitachi Vantara, businesses must understand the need for customer flexibility and reposition previously unimaginable shifts in service pricing to reflect the demanded flexibility. Understanding the market and business is crucial in deciphering the element of your product that truly makes a difference. Adobe's software may be top-of-class, but leveraging their ability to keep up with the latest trends in the industry and then simultaneously delivering those capabilities to their customers is arguably of greater value than simply the product itself. Understanding this can give businesses the confidence needed to shift their business models and remain agile, adaptive, and increasingly more competitive in their space.

Industry Forecast

Thought Leader: Mike Langellier

Position: CEO, Tech Point

Area for Disruption: Business to Business to Consumer

Professional Insight:

“There used to be more of a distinction between B2B and B2C and now that seems that B2B is becoming increasingly important, which has implications for a lot of different things. The brand that a company needs to develop, its communication and marketing

channels, its relationship with partners, its communication and distribution model of the internet versus traditional sales and distribution channels. I think it will have a significant impact on the pendulum on the pendulum of both power and then pricing premium. For producers or manufacturers, those that are producing the product, if they fail to maintain control of the distribution channel, then they put themselves in a position of commoditization. And, so I think that has implications not just the kind of industry player implications, but geographic implications. Because the places that are able to maintain a premium position have a direct interface to the customer.”

Industry Forecast

Thought Leader: Jennifer Merrel

Position: Senior Relationship Manager, Tech Point

Area for Disruption: Collaboration Boundaries Smashed

Professional Insight:

“There are no longer perceived or real barriers. With the onset of Covid-19, collaboration and an organization's ability to do it has come of age. Digitally. Small organizations and small teams have more easily been able to work in person and have relied on this old-school method. Large corporations have long subscribed to pockets of teams around the world having to digitally collaborate. The gap has the ability to narrow.

- 1) Companies of all sizes now have the ability to recruit and retain talent from “anywhere”.
- 2) Companies have no excuse to provide options for different work styles to maximize production
- 3) Companies that embrace and invest in the tools to make collaboration with anyone, anywhere, in any time zone will work faster, smarter, and lead the pack.

Teams, now having had to acclimate to fully virtual environments, at least in part, have been forced to lean into digital tools for work like never before. Large national or international teams have already leaned into virtual meetings and collaboration tools for quite some time. The tech industry was already familiar with many of these tools. The disruption is

in the mindset of "everyone else" and for the top tier talent recruitment ability of tech companies everywhere.”

Informational Resources

[6 Ways Technology is Disrupting Business Models](#)

[Digital Transformation in Professional Service Industry](#)



The Gig Economy

1 What is it?

While the term itself may seem fairly new to some, the concept has existed for quite some time. Formerly known as freelance employment or temp work, the gig economy has flourished into a trend leveraged by businesses looking to fill short-term positions. The gig economy simply refers to companies hiring temporary or contract workers rather than full-time employees. The flexibility of this trend can be a significant benefit to companies. Let us say that you are a clothing brand and you are in the process of doing major overhaul work on your website. After its completion, you would like to roll back to a minimal IT team that exists, for the most part, to handle small crashes and consumer issues. Rather than hiring full-time employees and having to deal with either their termination or finding more tasks for them, you simply hire them to complete that task, and then they are no longer a part of your team.

2 How does it work?

There is some variation on how the gig economy functions within different companies and industries. Some companies hire employees to handle one particular task and then end the relationship, like the website example. Contract work is another type of employment under the gig economy. This is where an employee signs a contract to work with a company for a set, usually shorter, amount of time. This can be useful in a variety of contexts, including seasonal or inconsistent demand, and temporary shortages due to parental leave. A prime example to think of is construction. Many employees do contract work for landscaping or construction companies. This means that when there is a new building that requires a large team, certain employees sign a contract to complete that task. Once it is complete, their relationship with the construction company is over. While the construction company is more than welcome to hire them again for future projects, there is no obligation

to do so. Contract workers can be paid hourly or can be in salaried positions.

Temp jobs are another type of work within the gig economy. These roles are usually shorter than even contract work, potentially being as short as a single day. Temp work is typically acquired through a temp agency or through headhunters whose sole purpose is finding folks to fulfill these quick tasks. It is typically labor that requires very little training with short notice for the employees to start the role. This usually falls into something like secretarial or office assistance.

Freelancers are also important to understand in the gig economy. This is someone who employees themselves and offers out their services for pay. They create their hours, usually set their own prices, and choose which gigs to take or pass on. An example of this is a freelance artist who creates logos for companies at a set price. Freelance photographers will often be hired for weddings to take pictures and then edit the photographs on their own time. Some freelancers continuously return to a company; many freelance writers will do an ongoing column for newspapers or websites without ever actually being hired.

3 Who's doing it?

One of the most prominent companies known for being a part of the gig economy is Uber. The ride-sharing application started with the intention of disrupting the taxi industry. Gig workers apply to drive for the company and, once accepted, they can complete as many or few rides as they'd like on their own schedule. Uber then pays them for the work they've completed, but gig workers with Uber and similar companies are generally exempted from many of the benefits that traditional employees receive.

Also in transportation, Amazon is utilizing the gig economy for some of their deliveries. Amazon Flex allows employees to register in blocks that work for their schedule and to do pick up and deliveries for the tech giant, all tracked by their Amazon Flex app. On top of that, Amazon is currently employing “Prime Now shoppers” in most metropolitan cities across the US. These are gig workers who select shifts they’d like to work online and, when needed, are paid by Amazon to do personal shopping at Wholefoods for online customers.

Gig work has even expanded into the medical field. Talkspace is a company that allows licensed therapists to connect with clients via smartphone, laptop, or tablet and conduct therapy sessions without being hosted through a medical facility or private practice. Talkspace provides both clients and therapists more flexibility in their meeting times, as well as allowing the therapist to set their prices and take on as many clients as they’d like. Talkspace takes a portion of the payments made from these sessions to provide the users with a Health Insurance Portability and Accountability Act (HIPAA)-compliant and Flexible Spending Account/Health Savings Account (FSA/HSA)-approved platform. That said, none of the therapists are fully employed through Talkspace and are not required to complete any tasks or fill any roles they do not want to.

4 Why is it significant?

The gig economy is becoming an increasingly common business model for businesses. At the end of 2020, there were around 57 million people in the US participating in some form of gig work, either as their main source of income or as a side gig. That makes up about 35 percent of the US workforce. That number has doubled in just the past five years and is expected to continue growing. An MBO Partners study estimates that by 2023, we will see half of all work in the US being completed in a gig economy model.

The Covid-19 pandemic has only expedited the spread of the gig economy. The gig economy’s main draw is the flexibility that comes with it. As Covid-19 forced more people to work from home and change their schedules to accommodate childcare and other responsibilities, the gig economy provided flexible sources of income. Because the pandemic also

affected many workers’ employment status, with many being laid off or taking cuts to their hours, the gig economy also provided a means to supplement income when necessary. Despite gig experiences often starting as something borne out of necessity, many workers have found they enjoy the freedom that comes with the gig economy.

5 What are the downsides?

For companies, one concern of the gig economy is that it eliminates employee investment and incentives to perform well. If you are aware that your job is a temporary one and that you can stop and leave at any moment to go fulfill a new role, you may be less likely to strive to perform well. A temp worker may know that they are going to be at an office job as a secretary for about three days. This may cause them to perform at the bare minimum level, as they would have no real fear of being reprimanded and will be leaving the position soon anyways.

There is also a significant amount of concern regarding how the gig economy affects gig workers and whether it is an ethical business model. To start, it provides minimal stability for workers. While some workers have specific contracts that state how long they will be at a company, many are working completely at the will of their employer and can be let go at any time, with no reason or warning. On top of that, the gig economy allows companies to cut corners when it comes to protecting and assisting their workers. Because gig workers are not employed full-time by these companies, they often will not provide them with any form of benefits like sick leave, insurance, holiday hours, etc. Many people are working as personal shoppers for Amazon for well over 40 hours a week, but are still not receiving any type of employment benefits.

Many gig workers who are completing roles for companies like Uber or Lyft report that they end up making less than minimum wage due to the fact that certain rides or tasks take so long to do and the company takes such a large portion of the payment. This leads to the gig workers needing to take on more and more jobs. However, gig work often requires workers to use their tools, meaning that someone who is driving for Uber is going to have to pay for gas, car maintenance, and insurance completely out of pocket,

doing even more damage to their final dollar. Because of this, the original appeal of flexibility begins to seem less realistic. The financial strain that comes with gig work leads many to work as much as possible. A gig worker for Amazon Flex, for example, is going to be at the beck and call of orders and will have to jump on any shift that becomes available, desperately competing for opportunities against other gig workers.

6 Where is it going?

Companies are likely going to continue to engage and stimulate the gig economy. With Covid-19 showing both employees and employers that a traditional in-office 9-5 isn't necessarily required for productivity, we are likely to see an increase in businesses pushing for greater workplace flexibility. The gig economy could be well-positioned to meet some of that demand for flexibility, but the appeal is significantly reduced by the challenges and drawbacks to gig work. Over the coming decade, ridesharing, distribution, and other prevalent sectors of the gig economy will continue to constitute a significant portion of this style of work.

With that said, the way in which gig workers are treated and employed is likely to look quite different in the coming years. Because of the increase in contract, temp, and freelance workers, as well as concerns of exploitation from companies, there is a push for legislation demanding more protections for gig workers. The Biden administration has signaled support for reclassifying what is seen as a contract employee and is calling for companies like Uber to provide their drivers with more employee benefits if they are working hours that would be considered full-time. Biden's campaign website states "Employer misclassification of "gig economy" workers as independent contractors deprives these workers of legally mandated benefits and protections. Employers in construction, service industries, and other industries also misclassify millions of their employees as independent contractors to reduce their labor costs at the expense of these workers. This epidemic of misclassification is made possible by ambiguous legal tests that give too much discretion to employers, too little protection to workers, and too little direction to government agencies and courts" [101]. With many politicians proposing legislation and calling for changes to the gig economy, it can be expected that the gig

will significantly evolve in its employment structure and compensation.

Industry Forecast

Thought Leader: Frederic Fransen

Position: CEO, Certell, Inc.

Area for Disruption: Increasing "gigification" of the workplace.

Professional Insight:

"The preference for working from home that so many people tasted will survive COVID for many people. Once you're no longer under the eyes of your employer, supervision becomes much easier in a contractor relationship, than in an employee one. While many people will go back to work, a permanent shift will take place away from employees for people working from home. People who can successfully work from home tend to be more productive and more entrepreneurial. It also changes the value-proposition of cities. Places like New York may return as a tourist destination, but far less of the productive activity of such cities will be happening there, leading to a deconcentration of talent, and greater geographical equality. A shift for more workers into the services gig economy will lead to overall productivity gains, as well as greater happiness as people gain greater control over their lives. will create bigger gaps between the entrepreneurial haves, and the more supervision-needy have-nots."

Informational Resources

[Contract Work](#)

[Defining Gig Economy](#)



Talent Attraction and Developmental Changes

1 What is it?

In the post pandemic era, organizational talent attraction and development is tasked with addressing the widening skills gap, effective onboarding and continued development of employees, and the cultural shift into continuous learning and education. As the pandemic forced many organizations to cease in-person activities, research suggests that virtual programming can be as effective as in-person training once was. To remain relevant and sustainable through times of disruption, especially as workforces become more distributed, leadership, management, and HR will have to reconsider their roles and redefine how they coach, teach, and educate employees in order to develop effective training programs.

The goal of this section is to provide insight as to how organizations can redesign training and development programs to increase employee competencies, engagement, and retention in a way that increases the bottom-line and productivity within the organization. To effectively initiate successful training and development that attracts and retains top talent, organizations must realize that training is not exclusive to “hard” or technical skills. In addition, digital learning is not the only way to implement a successful training program. Training and development is a holistic process that simultaneously cultivates employee and management resilience and crisis management, as well as interpersonal and emotional intelligence skills.

2 How does it work?

Organizational training and development have become synonymous with digital tools. While the various training methods are discussed in a later section, effective training and development factors in the needs of the entire organization. As businesses evolve and adapt to change, organizational talent

is a critical ingredient in successfully moving teams forward. In addition to resources, organizations should view training and development through a holistic business lens.

When increasing their talent pools, organizations often must choose between hiring new employees and reskilling or upskilling the current staff. While talent can be effectively cultivated within, hiring new employees is inevitable at times and must be approached appropriately. Hiring and onboarding during and post COVID-19 has proliferated the use of virtual interviews and training tools to ensure the proper selection of candidates and their successful onboarding. A key consideration for successful onboarding is shared by the Chief Human Resources Officer at Randstad North America, Jim Link. Jim’s insights are applicable to training and development in addition to onboarding. Via SHRM.org, “remote onboarding requires much more than attending virtual training and sharing a digital copy of the company handbook.’ Onboarding should always be paced, he said, and this is even more important with remote workers to avoid overwhelming them. ‘Space out virtual training and exercises and give new hires some free time during the day to absorb the information and ask questions” [102].

As organizations rethink their digital strategies around onboarding and hiring, disruption caused by the pandemic has initiated a global movement toward skill building and development for current employees. In a 700-participant global survey conducted by McKinsey, they found that “more than half of respondents say that their companies plan to increase their spending on learning and skill building over the next year, compared with their investments since the end of 2019” [103].

This and further data suggest that the investment into training and development will be a continuous process that organizations will have to monitor,

measure, and refine to ensure alignment with overall business goals. While this commitment to reskilling has become ubiquitous, it is critical that companies carefully consider and plan their reskilling strategy to maximize employee engagement and company benefit.

To maximize the reskilling investment, organizations should evaluate how their business processes have evolved during their digital transformation. For example, if the organization now maintains a greater presence in e-commerce, the organization must evaluate whether current staff have the skills to manage the digital platform and customer relation dynamics that evolve with it. Analyzing long-term strategy and the e-commerce platform's future role in operations should be a critical consideration in designing the developmental needs for employees. Organizations may consider delivering assessments to gauge proficiency in key areas such as web development, software development, and interpersonal skills. Training may then be developed concentrically around these missing skills and leveraged in evolving business processes.

Evaluating the current employee base through the lens of relevant future skills will help organizations understand where strengths and pitfalls reside within their workforce.

Once the organization develops a clearly defined roadmap for progressing with training, attention can be turned to improving the resources available to employees. In tandem with offering training tools, organizations should aim to track the training's effectiveness and return on investment. McKinsey conducted a survey on the economic impact of reskilling programs in the United Kingdom, leading to insights that inform organizations on how to shape training programs. Among the recommendations for optimizing training programs and closing the skill gap, McKinsey offers two critical suggestions, "offer on-the-job reskilling. Given that the average employee has less than half an hour a week for formal learning, employers can benefit by incorporating on-demand learning and on-the-job training...Employ modular reskilling. A powerful mode of learning is modular, bite-sized training. On average, this is almost 30 percent cheaper than learning delivered in a single aggregation of topics, fits more easily into employer schedules, and delivers almost twice the ROI of the more traditional approach" [104].

In accounting for the ROI of a training program,

organizations must consider whether metrics are measurable through profits directly derived from the training or through other means. While training may not directly impact profitability, the organization must consider the value of retention in their employee base. Should the training be effective in engaging employees while increasing their productivity, organizations can evaluate the ROI through how the training avoided the costs associated with new hires and onboarding. Southern New Hampshire University proposes multiple methods of conducting an ROI evaluation of training and development. Among these methods is a direct profitability equation represented as $ROI = \text{net monetary benefits of training} / \text{total costs of training} * 100$. Alternatively, organizations can turn to the Kirkpatrick Model to measure "reaction, learning, transfer and evaluation" [105].

Perhaps the most critical factor in successful training and development programs is the ability of the organization to integrate the learning into its culture. Without a clear relationship tied to career progression, ease of access to these resources, and the understanding that pursuit of skills development does not indicate poor performance, training and development may not resonate with the employee base and risk being overlooked. Leadership sets the tone for the organizational culture. While management is often evaluated based on the performance of key business metrics, productivity among the team may be an additional metric in manager evaluation. Management's investment in employee growth will also ensure that they are guiding employees down relevant career development paths and furthering the trust and engagement of the workforce. It is critical to note, however, that skills development should not be arbitrarily pursued.

Organizations must remain cognizant of whether incentives for reskilling or upskilling are appropriately tied to tangible outcomes. Policies that promote interaction with training materials solely for visibility among leadership risks lack of employee direction in moving themselves and their position forward in alignment with company objectives. Additionally, McKinsey offers perspective on the importance of engaging leadership to avoid these unintended consequences while normalizing training within the culture. "Workers often feel unsupported in training, and fear failure. Leaders and managers can serve as role models for learning, actively participating in training, and communicating personal challenges and failures along the way. Organizational

transformations where leaders model the change themselves are more than four times more likely to succeed than transformations where they do not” [104].

Organizations should continue to follow up on the measurements of their key metrics as employees and leaders alike continue to engage in training.

3 Who's doing it?

McKinsey's 700-participant reveals that, of the 700 participants, “skill building is more prevalent than it was prior to the pandemic, with 69 percent of organizations doing more skill building now than they did before the COVID-19 crisis.” Reskilling and upskilling programs are ubiquitous within organizations across all industries. In a spotlight article with Forbes, the National Bank of Bahrain (NBB) outlines their key lessons learned through developing their people during the COVID-19 pandemic. In the article, Chief Human Resources Officer, Dana Buheji states, “despite the current situation [the aftermath of the COVID-19 pandemic], our commitment to continue human capital development, mentor the best talent, and groom leaders from within remains a strategic priority. It's critically important to us to continue to enable and empower our staff to carry on their professional development without disruption” [106]. This philosophy was executed by leveraging videoconferencing to introduce their teams to global experts. Training conducted via these teleconferences ranged from “technical finance and banking training to guidance on leading change and how managers can become better coaches” [106].

In addition to expert accessibility, NBB held each employee, including management, accountable for their development. “Managers are taught and incentivized to involve their employees in the design and planning of all important business and change initiatives to foster innovation and commitment and highlight areas for improvement.” This collaborative effort gained buy-in from employees and allowed teams to create a unified vision for how the company would move forward through challenging times. With management on board, there was accountability for growth, development, and tiered ownership for the direction of NBB's success. “Every employee was expected to attend a minimum of five training

sessions, including online modules and sessions led by internal staff and managers who don't normally lead classes... in June 2020 the total training hours amounted to 18,028—or 163% higher than the same period last year... The benefits have been immediately tangible in terms of morale and performance” [106].

This message is shared from the CEO down to the employees, demonstrating organizational unity and exemplifying the key tenant in all learning and development programs – it starts from the top down.

One of the largest insurance agencies in the world, Nationwide, integrates training and development into their onboarding process. Through leveraging various assessments in addition to face-to-face interviews, Nationwide is able to accurately assess the skillsets of new hires and match them with ideal roles. McKinsey highlights Nationwide's onboarding process to provide valuable insight into successful onboarding practices. “At Nationwide, reskilling follows a Recruit, Train, Deploy model. Candidates are recruited through face-to-face interviews, AI screenings and technical assessments. They receive an initial intensive 12-week bootcamp, where they learn skills to make them work-ready for specific roles. In one to two years, candidates graduate from the program, and are deployed in roles across Nationwide. This not only allows for seamless on-boarding, but also removes the risks of employment liabilities” [104].

Recruiting and retaining top talent is a holistic approach where organizations must consider the talent within the organization as well as external talent to maximize respective teams. In this practice, organizations seek to both optimize integration of new employees while leveraging the established cultural fit already present in current employees. Prioritizing training and development increases retention, engagement, and performance in these companies to ensure their continued success.

4 Why is it significant?

According to the World Economic Forum's October 2020 Future of Jobs report, “on average, respondents to the Future of Jobs Survey estimate that around 40% of workers will require reskilling of six months or less ... employers expect to lean primarily on

internal capacity to deliver training: 39% of training will be delivered by an internal department. However, that training will be supplemented by online learning platforms (16% of training) and by external consultants (11% of training)” [107].

This research presented by the World Economic Forum reveals the significance of properly evaluating training and development needs within the organization. In an era of significant disruption where business models and operational practices are changing to meet the demands of the marketplace, a business’ ability to survive and thrive depends on the competencies of its people. Addressing identifiable skills gaps with an influx of new talent is no longer the preferred method of infusing skills into the organization. In the McKinsey Global Survey, it was identified that “the urgency of addressing skill gaps is clear—and, across industries, more important than ever to do. Most respondents say that skill building (more than hiring, contracting, or redeploying employees) is the best way to close those gaps and that they have doubled down on their efforts to reskill or upskill employees since the pandemic began” [103].

This focus on reskilling the workforce is more than an attempt at remaining relevant. The study goes on to further demonstrate that proper investment in this area can catapult businesses to greater success. “Between 71 and 90 percent say their skill transformations have had a positive impact on four company outcomes: the ability to realize company strategy, employees’ performance and satisfaction, and reputation as an employer” [103].

With an increasing demand for employees to be proficient in skills such as analytical thinking and innovation, active learning and learning strategies, and complex problem-solving, organizations must give critical thought to how these skills can be honed through their internal training. This priority is further magnified in the context of the growing, pandemic-induced skills gap. “The findings from [the McKinsey Global survey] suggest that companies lack the talent they will need in the future: 44 percent of respondents say their organizations will face skill gaps within the next five years, and another 43 percent report existing skill gaps. In other words, 87 percent say they either are experiencing gaps now or expect them within a few years” [103].

As technologies and platforms such as artificial intelligence and cloud computing become more

ubiquitous, companies will need employees that understand how to navigate and optimize this technology. Proper investment in employee skill development yields not only intangible returns in the form of engagement, productivity, and retention, but allows companies to adapt and evolve service offerings, technology, and gain a competitive advantage in the marketplace. While technology presents immeasurable future opportunities, the research suggests that the workforce enables it to flourish.

5 What are the downsides?

Despite the immeasurable benefits associated with effective investment training and development programs, organizations of different sizes and industries are faced with challenges toward delivering these programs. Among these challenges are potentially prohibitive costs, delivery of quality content, lack of clarity defining relevant skills for future growth, and employee engagement.

- Prohibitive costs

In the context of reskilling displaced workers due to artificial intelligence automation displacement, the World Economic Forum estimates that it would cost approximately \$24,000 to reskill each displaced worker [108]. Depending on the level of training, these costs could account for internal trainers, costs of external training, and considerations for time invested in non-billable hours. Administrative costs may also be associated with implementing the training depending on platform selection. While e-learning is the primary form of development, consideration must also be given to evolving technologies.

As PwC revealed in a recent study, while Virtual Reality training may not be as prominent as other forms of digital training, it’s relevance could increase along with additional costs. “Because VR content initially requires up to a 48% greater investment than similar classroom or elearn courses, it’s essential to have enough learners to help make this approach cost-effective. At 375 learners, VR training achieved cost parity with classroom learning. At 3,000 learners, VR training became 52% more cost-effective than classroom” [109]. With increased learners, the costs associated with this technology continue to decrease.

As companies tailor their training and development

options, careful consideration of how newly adopted skills will shape the future for the organization can help narrow the scope and budget of implementation.

- Delivery of quality content

In addition to financial factors relating to training and development, organizations must be certain not to cut corners in their training. Quality training is crucial for employee development, engagement, and growth. The importance of quality is demonstrated in a 1,235-person survey of United Kingdom-based full-time employees conducted by Forbes. It is stated that “many [employees] have struggled with the resources used to deliver remote training, with just under a half finding online learning solutions provided by their employer to be too generic. A similar proportion said their businesses ought to invest in better digital learning tools or courses over the coming 12 months” [110]. While cost can largely influence the quality of training and development, it is recommended that organizations invest in programs that are relevant to employee career paths and that challenge their employees to grow. Under delivering or failing to deliver a relevant platform and experience could be detrimental to long-term retention. In that same 1,235 person survey, Forbes reported that “more than a fifth of those interviewed suggested that they would consider leaving their jobs in the coming year if their employers did not invest more actively in their professional development. For those under 35 [years of age] the figure jumps to nearly a third” [110]. In attempting to deliver this quality program, organizations must develop clarity around what skills are required for employees to develop greater capabilities. This presents an additional downside.

- Lack of clarity in relevant skills

As disruption transforms businesses and industries alike, it can be difficult, if not impossible to predict which skills will be most relevant. A brick-and-mortar store that instantly becomes an e-commerce-driven business may have previously been unaware of the relevance of cloud computing and digital marketing. It is here that data from the World Economic Forum can be further leveraged. In a recent report titled *Towards a Reskilling Revolution*, the World Economic Forum identified that Big Data Architects, Automation Technicians, Renewable Energy Engineers, and Automation Engineers were among the top five emerging jobs in the United States [108]. While these jobs may fall outside of the scope and relevance depending on their business-line, organizations can

look to this report as well as the World Economic Forum’s *The Future of Jobs* report to determine growing areas of technological advancements. Companies can begin to consider how these areas will fit into their strategic plan and begin optimizing training programs toward moving in the direction of the identified technology.

- Engagement

Investing time into developing a strategic reskilling plan followed by an investment of capital in executing this plan presents risk to the company. It is in the company’s best interest to ensure that professional development opportunities are intertwined with relevant employee objectives and incentives. Failing to consider the holistic impact of integrated culture surrounding continuous learning could be detrimental to organizations. As revealed in the *Future of Jobs* report, “employers surveyed through the *Future of Jobs* Survey report that, on average, they provide access to reskilling and upskilling to 62% of their workforce, and that by 2025 they will expand that provision to a further 11% of their workforce. However, employee engagement into those courses is lagging, with only 42% of employees taking up employer-supported reskilling and upskilling opportunities” [107].

Subpar engagement will result in subpar return on investment and results to be gained from that engagement. In addition to creating a strong incentive structure, employers must embrace the subsequent challenge of tracking metrics and progress related to development programs. McKinsey emphasizes this point through their recent *Global Survey*, “just 23 percent of all respondents whose companies have started a skill transformation say that they have implemented dynamic tracking of the workforce’s performance and overall impact on the business. But it is critical to perform each of these practices to reap the full benefits of a skill transformation” [104]. Through combining these perspectives with the research conducted for this report, it is evident that training and development programs will be crucial to the sustainability of businesses of all sizes and stages. Despite the reskilling revolution, there are multiple potentially significant downsides to manage. With intentional preparation and consideration of these downsides, organizations can begin to build a culture around training and development that enables each member of leadership and staff to be successful in the present and for the long-term.

6 Where is it going?

The COVID-19 pandemic introduced the realization that every company is a technology company. Whether utilizing electronic payment methods at a brick-and-mortar store, leveraging web development for an e-commerce presence, or providing cloud-based software solutions, each business depends on technology to reach its customers and process transactions. The degree to which businesses will be disrupted by technology may vary, but the emergence and evolution of well-established technologies alike will continue to revolutionize how consumers interact with brands and products. As this realization is accepted, organizations must also realize that, in addition to being a technology company, they are also training and development companies. To keep pace with change, an organization's greatest asset is its people. The expertise and growth of the teams that comprise the company will allow flexibility for the company to adapt to rising issues and trends. With this in mind, investment into training and development may be the most important investment organizations make in the next 10 years.

Consider the ramifications of reskilling in the United Kingdom. The McKinsey Global Survey found that “effective reskilling tends to bring a productivity uplift of 6 to 12 percent. Our analysis also suggests that virtually every UK worker needs reskilling: about 30.5 million UK workers (94 percent of today's workforce) lack the full suite of skills they will require in 2030 to perform their jobs well. Among these workers, 25.5 million would benefit from upskilling, and a further five million require retraining” [104]. In a world where customers and employees are seamlessly integrated and the advancement of society relies upon the competence of knowledge workers, organizations cannot afford to neglect the growth and development of their people. As technology progresses, so too will the formats in which training and development are adopted to effectively meet the demands of skill enhancement. Consider PwC's research into the efficacy of virtual reality adoption for skill development.

“The PwC study found that 78 percent of all VR participants preferred virtual training over online and classroom instruction. Between February and October 2019, a subgroup of PwC's Emerging Technology Group studied the impact of using VR to train

1,600 new managers on inclusive leadership. The study concluded that VR was 52 percent more cost-effective and four times faster than classroom training.” According to the study, it takes about two hours to complete classroom instruction, 45 minutes for an online course and 29 minutes of VR training to teach the same content. Further, the managers receiving VR training said they “felt more connected to what they learned and more confident about using those skills than if they had learned them in a classroom or in an online learning module” [109].

VR training also allows for an immersive experience that eliminates distractions while engaging each of the five senses. Issues surrounding attending to and retention of the material in a self-paced class or classroom can be eliminated as the employee is fully immersed in the training experience. It is also in this space that employees can fail freely as they experiment with different approaches to problems, interactively simulating various business situations that may arise in the workplace.

The future will feature multiple learning methods as companies optimize the development of their workforce. McKinsey's Global Survey articulates the overall direction of a highly efficient training program and, consequently, a highly trained workforce. “Out of 12 learning formats, respondents say that an average of five formats are suitable for their companies' employees. At the companies that have already begun skilling transformations (reported by half of all respondents), the rate of success is higher when respondents cite a larger number of learning formats: it is 50 percent for those who identify fewer than four formats, and more than 70 percent for those who cite eight or more... Respondents who cite peer learning teams or expert coaching are likelier to report successful transformations, which underlines the importance of the team-based learning that, in our experience, is a crucial ingredient in successful skilling strategies” [103].

Respondents whose organizations are building employees' skills are more likely to say their organizations are prepared to address role disruptions than are respondents whose organizations address gaps through other methods. Of the respondents from organizations working to build skills, 44 percent say they are prepared, compared with 19 percent of those at organizations taking other actions. Looking ahead, respondents are much more likely to cite skill building, rather than hiring, as the most effective way to close skill gaps in the next five years [103].

As the implications inherent to the future of work evolve, organizations will prioritize reskilling and upskilling above all other forms of talent attraction and development. The emphasis on team-based learning also stresses the importance of culture-driven training to isolated training programs. The future is bright and rich with possibilities. As humans develop, learn and grow, they can contribute to the advances that will afford organizations the opportunity to advance society, become more profitable, and better serve their customers and those for whom they make an impact.

Industry Forecast

Thought Leader: Chris Hutchinson

Position: Sr. VP of Engagement, Eleven Fifty Academy

Area for Disruption: Segmented training that follows the lifelong learning model

Professional Insight:

“Remote working has changed the way training is administered and received. Training should be broken up into smaller segments so that it doesn’t become an additional virtual burden on folks who need to find ways to get work done. Traveling for a week of in-person training will be a thing of the past. “

Industry Forecast

Thought Leader: Matt Ranft

Position: Director of Sales & Marketing, Fairchild Communications

Area for Disruption: The need for a self-education mindset

Professional Insight:

“Shifting to thinking “there’s probably an easier way, I just need to figure it out,” the attitude of self-help and exploration is a skill that is developed. Instead of sitting back and waiting to be trained, you figure out what you need to do to do your job. We want to see people that assume responsibility for their own learning and training. With tagging and logging, all of the information you need is going to be there.”

Informational Resources

[McKinsey Global Surveys](#)

[Adapting workplace learning](#)

[Reskilling Revolution](#)



Increased Focus on Corporate Responsibility

1 What is it?

Reflecting on the previous year, Gartner assessed it well: “disruption is the hallmark of 2020” [111]. The fear-filled atmosphere included a pandemic with many unknowns; personal isolation, social unrest regarding racial inequality, political turbulence, job loss, financial hardship, widespread “fake news”, and a worsening climate crisis all sparked many emotions, often unique to the individual. This dramatic combination not only highlighted how organizations are treating their current employees, but what businesses value and how it is implemented.

It’s amazing to consider that the year 2020 saw the largest and most rapid re-deployment of employees since World War II. The scale of this re-deployment was characterized by an increase in both digital and distributed teams, in addition to the increased responsibilities, health concerns, emotional, and financial consequences of COVID-19 [112]. As we adjust to life with more people getting vaccinated daily, a tentative reduction in the prevalence and severity of COVID-19 cases, and the economy steadily improving, it’s important to not assume a “back to normal” mindset. In fact, there is power in embracing problem solving amidst uncertainty. In this new landscape, possessing the agility to “make it possible to imagine multiple futures” is our new normal [112]. As Glassdoor explains, our national economy is “permanently changed” following a recession, especially due to technology, consumer preferences, and changed attitude towards risk. This was not only a financial recession, however, and it would be unwise to downplay the social concerns and their impact on individuals, leaders, and businesses in the years ahead. Just as security will be emphasized for individual benefits, diversity, equity, inclusion (DEI), and how an organization implements its values are now expectations of a business. This includes how an employee is treated day-to-day, a team’s culture, and hiring practices - “How we hire, work and embody company culture changed overnight” [113].

2 How does it work?

Diversity, equity, and inclusion (DEI) is now expected (for some even a nonstarter) by employees and consumers alike. According to Glassdoor, these initiatives have been on the rise for some time, but are expected to surge in the next decade. Widespread dialogue and increased visibility surrounding racial and gender inequalities have made it clear that current disparities are unsustainable and deeply ingrained, especially in industry. Not only is it essential for businesses to demonstrate a genuine commitment to confronting these challenges, but every member of the organization must also be equally dedicated to the belief that diversity, equity, and inclusion matter and make the organization stronger. Leaders must be held accountable, which includes ensuring recognition for championing DEI efforts and initiatives. All employees should be educated and encouraged to evaluate current team workflows and rhythms to determine where improvements can be made. Organizational psychologist Dr. Adam Grant highlights potential barriers to inclusion when companies prioritize hiring for “cultural fit.” He argues that cultural fit holds organizations back and leads to group-think - when organizations prioritize hiring based on certain values, people tend to hire people most similar to themselves and significant diversity of thought is generally lost for that organization. This results in diminished originality and market advantage, not to mention a missed opportunity to improve and enrich teams.

Instead of this “culture fit” mindset, organizations should implement “value fit, culture add” as shared by Albrey Brown, Airbnb’s head of Diversity, Equity, and Inclusion. This approach intentionally considers candidates who fit within core values systems and also add to current culture to create a stronger team. Many organizations now have an amazing opportunity to hire from diverse locations and allow their employees to work from their preferred location – apart from increased innovation and a perk for

employees, distributed organizations offer significant potential for elevated team and thought diversity. Historically, corporate DEI movements have been slow and lacked accountability, but the general consensus among industry and thought leaders is that DEI initiatives already hold more influence than ever before, and this influence will only continue to grow. It's worth noting that 87% of employees said businesses should take a public position on societal issues relevant to their business; in an increasingly interconnected and distributed world, the impact and relevance of DEI will influence leadership and structures, regardless of industry or sector [111]. The enduring importance of DEI is indisputable; in the next decade and beyond, the commitment with which businesses embrace and integrate these values will play an increasingly vital role in the legitimacy, innovation, and long-term health of these organizations.

3 Who's doing it?

According to research from Fashion Snoops, employees individually are placing increased focus on betterment and belonging; organizations would benefit from incorporating these values into their culture support systems. Notably, there is a growing interest in proactively enhancing one's quality of life through integrative mental, physical, and emotional wellness [114]. Additionally, as technology provides unprecedented connectivity and increasingly blends the environments of home and work, employees are searching for belonging in all aspects of their lives [114]. As we exit a season of isolation and expanded childcare responsibilities, employees are craving a genuine, holistic, and supportive culture at work. Organizations who effectively address these desires with their cultures will demonstrate empathy and awareness of the needs of their employees. This not only encourages stronger performance, but also assists employees to continue their individual growth while maintaining engagement (even through disruption). If employees are to truly be a priority for an organization, their individual wellness must be valued and demonstrated through that organization's culture [112].

4 Why is it significant?

It's not that culture needs to be especially complicated or difficult to communicate, including in a remote and hybrid work transition. Glassdoor highlights three factors that matter most for employee satisfaction that will remain highly relevant for the decade ahead: having a compelling company mission, promoting transparent and empathetic leaders, and building clear career opportunities for workers [113]. Expanding on this, Visier research found that there has recently been an increased demand for employee monitoring software to support wellness initiatives while workforces are largely remote; despite the potential benefits of this interconnectedness, organizations must be intentional about what data is collected, how it is being used, and communicate openly with team members. In this example, it is important to note the distinction to decision makers and employees that "monitoring activity is not the same as monitoring productivity." Creating a strong employee experience includes evaluating team dynamics and communicating the purposes of workplace monitoring and any employee data collection. Interestingly enough, the organizations who will thrive in the years ahead will be those who correctly value employee sentiment data as business intelligence [113].

5 What are the downsides?

Individuals are utilizing technology to be more informed consumers beyond the product or service for sale and are interested in the organizational belief system behind it. In fact, recent research demonstrates that 60% of people will boycott a brand if their values do not align [112]. As individuals and brands expand their reach through technology, it's important to note the current and projected value of social media. Social media is "the leading light in customer loyalty", and organizations need to strategically share appropriate, desirable content to increase supporters of their brand [115]. Connecting organizations to prospective customers is certainly helpful, but the bulk of corporate social media exchanges take place with current customers. If leveraged intentionally, technology can be a tool to create highly loyal customers through understanding the engagement expectation and extending the organization's brand, mission, and values. Hootsuite summarized the

blunder many organizations experienced last year: “Purpose-driven companies will certainly be on the right side of history in the years to come—but becoming one isn’t something you can fake or simply mimic on social media.” Instead, Hootsuite recommends using social listening as an intelligence tool. This requires an awareness of changing customer needs and pain points to make smarter decisions [115]. More than ever before, customers are concerned with how employees are applying an organization’s values, including if they appear to believe them, and employees (and future employees) are concerned about the organization’s image to the customer. Both expect progress. Both have a loud voice and the power to influence. It is undoubtable that technology can be a catalyst for advocacy against abuses of power.

6 Where is it going?

Looking ahead, employees are predicted to place a higher value on stability and career predictability. This included increased benefits packages, more inclusive healthcare plans, expanded paid time off, hybrid work environments, and accommodative work schedules [113]. Especially in the next decade, Visier research recommends organizations fully commit to an intentional ‘culture-by-design’ instead of a natural culture because it allows leaders to naturally prioritize the best of the culture to apply in a hybrid work environment [112]. Glassdoor also found that even fully remote teams must connect consistently in-person to build trust, create emotional bonds, and establish a team sub-culture. It’s vital for employees to have unplanned, non-work connections (preferably in person) - teams who do this consistently are regularly more innovative and creative. It is convenient for organizations that most employees (70.1%) are interested in a hybrid working model. Successful organizations will manage this expectation well, but organizations must be intentional about their culture in the immediate future when opportunities to connect in person are limited.

Industry Forecast

Thought Leader: Renee Wilmeth

Position: Entrepreneur

Area for Disruption: The long-lasting impacts of political and social change on companies as employees increasingly demand they change cultures to embrace social issues.

Professional Insight:

“Again, GenY is the key. As this large generation moves into the workforce they have an expectation that business leaders stand for *something* -- and that the company they support has a mission outside its core industry. WFH will accelerate a blurring of work and home life. Companies have to keep up with the idea that their commitment to social issues matters to employees.”

Informational Resources

[Social Responsibility in Business](#)

[Corporate Responsibility and ROI](#)



Global Politics & Global Threats

1 What is it?

Our respondents indicated that the largest future disruptions that would impact businesses on a global scale are climate change and the rapidly changing cyber security landscape amidst international instability.

Climate change is the single greatest factor threatening businesses, industries and companies on a global scale. As the planet continues to warm, disrupted supply chains, rising insurance costs and labor challenges will continue to negatively impact business operations. Climate-related events are impacting 1 in 4 organizations worldwide, with extreme weather events having a direct impact on 70% of all economic sectors [116]. Private sector businesses and governments have a responsibility to adjust their practices and change their business models to create a more sustainable future.

Additionally, businesses are increasing their investments in security, most notably through internal or managed security solutions and disaster recovery plans. As ransomware attacks and direct attacks on critical infrastructure become more common, businesses are pivoting to invest additional resources to secure their ecosystems. As more businesses rely on leveraging digital devices to collect consumer data, they incur the responsibility of storing, processing and protecting them from threat actors. State-sponsored malicious actors will continue to attempt to find security weaknesses in businesses that leverage large amounts of consumer data. The end goal of private-public collaboration is national and corporate resilience against global threat actors [117].

As climate change and cyber security threats continue to plague every industry, businesses must reimagine the opportunity that renewable energy and sustainable operations can create while repositioning themselves to protect their critical infrastructure from global threat actors.

2 How does it work?

Climate change has permeable effects across every industry in every country. Weather patterns are going to continue to change at unprecedented rates, leading to more severe storms, longer droughts, deeper floods, and more aggressive winter storms. These changes impact businesses at an incredible level, from international shipping becoming more dangerous, agricultural regions getting decimated, and coastal economies suffering in the richest countries [118]. The demand for goods will also change as regions experience weather patterns they aren't used to.

Organizations have the opportunity to respond to these threats by adjusting their business models to reflect sustainability. The first step for businesses is to develop a climate action plan that outlines the goals and targets the company wants to achieve and how they will accomplish those objectives. Goals could include reductions in greenhouse gas emissions or investments into renewable energy sources. Carbon neutrality and supply chain sustainability are key factors in reducing the impact businesses have on the environment. After goals and targets are outlined, the board should be monitoring progress quarterly and reporting back to shareholders.

The private sector has driven innovation for years, and they should be leading it in regards to climate change as well. Waste management and renewable energy are key areas where business can drive technical and economic influence to mitigate climate change. Having a diverse workforce and a culture where new ideas are encouraged are steps businesses can take now to drive innovation.

Additionally, as consumers continue to demand sustainability and environmentally friendly products, companies are in the position to demand their supply chains recognize these shifts. "With competition among suppliers in many industries, suppliers may

choose to comply to be able to do business with the companies demanding sustainability in their supply chains” [119]. Apple has set the goal of becoming carbon neutral by 2030, and in order to accomplish this, their supply chain of thousands of smaller businesses must also be carbon neutral. If more businesses took a similar approach, there would be a ripple effect and private industry would be at the forefront of economical and global change.

From a cyber security perspective, there are looming global threats that will impact all businesses if they aren't prepared. Online forums have made it easier and cheaper for individuals who have very little experience to perform a cyber crime. Tools that can cause incredible amounts of damage are available online and accessible by anyone. Obtaining and engaging in a cyber crime has never been easier due to online forums that promote and sell their tools. These crimes most prolifically take the shape of ransomware attacks, which continue to wreak havoc on businesses and consumers alike.

According to Accenture, “The global ransomware crisis has entered a new phase, as threat actors adopt stronger pressure tactics and new targets—in particular, manufacturing and critical infrastructure. Ransom impact is more widespread, with attacks often highlighting weaknesses in a company's security posture” [120]. The United States has suffered two critical cyber security attacks in the last 12 months, the SolarWinds supply chain compromise and the ransomware attack on Colonial Pipeline. Ransomware and supply chain attacks are becoming more common, and as companies interact with third-party vendors and other entities in their supply chain, the risk couldn't be higher.

Organizations should be investing into enterprise risk management teams and additional security measures regarding their third-party ecosystems to best protect themselves and their customers. The alliances that exist amongst global cybercriminals adds an additional layer of complexity and threat potential, “There is a great deal of churn in the alliances among cybercriminal threat actors' social networks, making attribution difficult. Groups are rebranding or swapping code amongst themselves to hide their identities within criminal communities” [121]. In order to adapt to this evolving threat landscape, business models must prioritize organizational cyber security. Security departments stereotypically struggle with limited budgets, but the astronomical financial and reputational costs of ransomware and other attacks

leave no doubt about the criticality of cyber security in modern enterprises. When given the choice between a \$1 million cyber security budget or a \$15 million ransom demand, forward-thinking business models will increasingly support and invest in proactive cyber security resources.

3 Who's doing it?

There are a range of technology companies improving their business operations and models to ensure they are being sustainable and environmentally conscious. Private industry is a significant contributor to climate change and will be equally impacted by its effects. Microsoft and Apple are taking massive steps to adjust their business models. Microsoft is focused on being carbon negative by 2030, not just carbon neutral. Additionally, they have plans to remove the “amount of carbon it has emitted since it was founded” by 2050 [122]. While they strive for these goals, they are also supporting using their voice and power on public policy issues to support institutional change in how businesses are managed.

Relatedly, Apple has committed to being 100% carbon neutral for its supply chain and products by 2030. Apple has already achieved carbon neutrality for its global corporate operations, but their supply chain consists of an array of other organizations. Apple CEO Tim Cook said: “Businesses have a profound opportunity to help build a more sustainable future, one born of our common concern for the planet we share” [123]. The objective for Apple is to ensure that every device sold will have net zero climate impact. Apple is achieving these goals through their climate roadmap, a ten-year plan that outlines a series of innovative actions. These are the types of goals and changes that are necessary from private industry to ensure future wellbeing.

In the sphere of cyber security, public and private sector business models are closely intertwined. This is especially true in the area of critical infrastructure, which is of key importance to both public and private stakeholders and is therefore a highly attractive target for malicious actors. This intersection of public and private interest was highlighted by the infamous ransomware attack on Colonial Pipeline; in the aftermath of the attack, the Cybersecurity and Infrastructure Security Agency (CISA) and private sector security specialists both worked with Colonial to mitigate losses and attempt to secure its networks.

A standalone federal agency, CISA helps other government agencies and private sector businesses address cybersecurity and infrastructure threats. Shortly after the Colonial attack, President Biden signed a sweeping Executive Order (EO) in an effort to revamp the defensive posture and cybersecurity capabilities of federal agencies and critical infrastructure. This EO seeks to implement cybersecurity best practices across the federal government, including measures like multi-factor authentication and encryption for at-rest and in-transit data. This EO dramatically elevates the influence and importance of CISA's role, which will include implementing improved security standards across the federal government, strengthening supply chain security (explored further in the following section), improving incident detection and response, and, critically, facilitating the exchange of threat intelligence between the public and private sector [124]. The federal government possesses access to classified information and capabilities that are often beyond the reach of the private sector, while private companies are often able to innovate and implement change quickly without the bureaucratic barriers inherent to government. A robust and complementary public-private partnership will be vital for a unified and resilient security posture, and CISA will play a leading role in nurturing this collaboration from the public side.

On the industry side, organizations have adapted their business models to varying degrees in order to confront emerging cyber threats. Most Fortune 500 companies possess the resources and motivation to monitor and address the cyber threat landscape; even The Walt Disney Company maintains a team of Cyber Threat Intelligence analysts within its Global Information Security group, conducting research and analysis to understand, identify, and mitigate internal and external cyber risks [125]. Many businesses cultivate their own in-house cybersecurity capabilities, but there is also a significant and growing market for specialized cybersecurity companies, many of which offer managed services and solutions to businesses that lack necessary capabilities of their own. CrowdStrike and FireEye, Inc. are household names in cybersecurity and threat intelligence, but Dragos, Inc. and Recorded Future are much smaller businesses (less than 500 employees each) that are carving out distinct niches in the cybersecurity arena.

Founded and led by cybersecurity experts with deep public and private sector experience, Dragos, Inc. has established itself as a leading authority in industrial cybersecurity.

Most people are familiar with the concept of IT, or information technology, but in the world of critical infrastructure, operational technology (OT) refers to the computing systems that perform key infrastructure operations involving power grids, oil and gas, water, transportation, and other industrial sectors. Industrial control systems (ICS) refer to systems within OT that monitor and control these operations [126]. The shutdown of Colonial Pipeline's ICS/OT systems was what halted the flow of fuel and created the gas shortage, and Dragos' specialization in ICS/OT security is what distinguishes it as a leading business model built to address the pressing need for critical infrastructure security.

In the wake of the Colonial Pipeline attack, Dragos CEO Robert M. Lee acknowledged the widespread cyber risks that threaten organizations of all sizes and industries: "All of our industries are going through some level of a digital transformation, which means they're becoming more and more connected... that connectivity allows adversaries the opportunity to come into those systems and compromise them" [127]. Through a robust suite of services that include architecture and vulnerability assessments, threat hunting, incident response, and readiness assessments, Dragos leverages its critical infrastructure cybersecurity expertise to protect six out of the 10 largest oil and gas companies and nine out of the 10 largest electric utility companies in North America and Europe, the Middle East, and Africa (EMEA) [128].

Beyond the focused ICS/OT mission of Dragos, Inc., Recorded Future harnesses the power of machine learning to create the world's most comprehensive threat intelligence reference data set. Continuously synthesizing data in seven different languages from the open web, dark web, open-source and human-generated intelligence, and proprietary technical sources, Recorded Future leverages machine learning and natural language processing to maintain its trademark Intelligence Platform, at the center of which resides the Recorded Future Intelligence Graph. The Intelligence Graph contextualizes role-based intelligence involving brands, third parties, threats, SecOps, vulnerabilities, and geopolitics to create a centralized platform that delivers end-to-end threat visibility across the enterprise [129].

Recorded Future is a trailblazer in the cybersecurity application of machine learning, which constitutes one of the most significant Horizon Report

technology trends, but a key element of Recorded Future's business model is interoperability. In an increasingly integrated cybersecurity ecosystem, many businesses are complementing their internal security capabilities with specialized third-party offerings. Recorded Future's centralized Intelligence Platform directly integrates into dozens of these third-party security solutions. Adversaries exploit old and new vulnerabilities alike in order to execute ransomware and other cyber attacks, and what many businesses are lacking is a unified resource that provides timely and organizationally relevant visibility into these known and emerging threats. Recorded Future's unique platform delivers critical cyber threat intelligence that can help businesses make sense of massive data sets and manage organizational risk [129].

4 Why is it significant?

Changing climate is impacting every industry at various levels on a global scale. According to Deloitte Global's report, 80% of executives in the public sector and the consumer and life sciences/healthcare industries have already expressed apprehensions about the planet's future [130]. Many companies are already experiencing the negative effects of climate change on their business success. According to Forbes, the top five ways that climate is already impacting (or threatening to impact) global companies are [131]:

1. **Operational impact:** Nearly 3 in 10 organizations are noticing the operational impacts of climate-related disasters, such as facilities damage and workforce disruption.
2. **Scarcity/cost of resources:** Resources like food, water and energy are at risk due to both environmental and human causes, with the energy and consumer industries reporting the greatest impacts.
3. **Regulatory/political uncertainty:** Rounding out the top three concerns, over a quarter of executives say they are wary about shifting regulatory and political environments. The banking and life sciences/healthcare industries overwhelmingly cited this as the issue impacting their sustainability efforts the most.
4. **Increased insurance costs or lack of insurance availability:** Executives are very aware of how climate-related events have, in some cases, led to dramatic increases in insurance costs.

5. **Reputational damage:** Environmental sustainability efforts are becoming core tenets of organizations' culture and brand identity.

As companies adjust their business models, they will recognize the long term economic incentives, regardless of the short term cost. The need to collectively raise the bar is reaching a point of criticality. The negative effects of climate change will continue to get worse, impacting every aspect of every industry. CEO of Deloitte Global, Punit Renjen says, "Business can only succeed if society thrives. Now, it is vital that we all take the urgent and immediate action to reach the goals of the Paris Agreement." "While everyone has a role to play, we believe the future of our people, planet and profession depends on the business community taking measurable, decisive action on climate change" [131]

The opportunity for industries and individual businesses to change their approaches and refine their business models to one where sustainability is present, is now.

Modern cyber attacks involve leveraging technology and algorithms to drive cyber crimes on a global scale. Data security is essential and businesses must be in a position to protect and defend the data they own or have collected. Industries and organizations are experiencing an uptick in cyber threat intelligence (CTI) investments to protect themselves, "At a growth rate of only 3% in total employees it could be construed that CTI is struggling. But a closer look reveals that the space was growing at 34% at the end of 2019 and 5% in the first two months of 2020" [132]. It is becoming clear that security is a critical component for any successful business. The potential risk that cyber threats pose to a business and its interests are incredible. Here are five ways in which cyber crime is impacting global economies today.

1. **Operational Impact of Downtime:** In the weeks following a data breach or an attack, the business is generally offline and occupied with supporting their stakeholders and ensuring the security of their auxiliary networks.
2. **Thefts of confidential consumer data:** Many companies rely on information and data to target consumers, support payroll and navigate their website. As businesses are breached, troves of consumer data can be leaked or stolen for later use.

3. **Disaster recovery:** Some organizations take the precaution to back up or layer their data via a disaster recovery plan. Businesses must allocate proper resources to prepare for these new found threats.
4. **Economic Impact:** The massive ransom payments are not feasible for small or medium sized businesses, inherently leading to data being stolen from smaller businesses. Additionally, if a natural resource is affected by a cyber attack, there may be substantial societal disruptors.
5. **Reputational damage:** After a cyber attack, some businesses experience a decline in their stock prices or their valuations due to the vulnerability and potential inability to defend themselves in the future. Relatedly, if there are a large number of consumers who are impacted, they may be more aggressive toward the businesses.

Cyber threats affect all organizations regardless of size or industry, so all businesses must adapt their business models to prepare and defend against various cyber attacks.

5 What are the downsides?

As the climate crisis continues, the effects of climate change will put a higher burden on various populations and demographics. If leaders don't recognize the value of changing their business model, they will be left behind and become obsolete. Businesses have the power to make operational adjustments to drive sustainable, longer-term projects. As organizations continue to leverage customer data for their service, more data will be at risk from threat actors than ever before. The availability and affordability of ransomware applications and programs are rapidly shifting due to online forums and chat rooms managed by threat actors. Attackers have never been in a better position to harm your network or steal your assets than they are right now. Government and private industry must be prepared to prevent and defend their networks from threat actors. Organizations must be ready to mobilize their industries to drive bigger change and more awareness of digital security and the climate crisis.

6 Where is it going?

If there isn't a partnership between private companies and government agencies, the hopes of addressing climate change at a global scale are nearly unachievable. There is value in collectively moving to reduce the negative effects of climate change. We can expect to see shifts in how businesses use supply chains, which organizations they choose to work with, and how closely they stick to their goals.

Moving forward, all businesses will need to invest in and bolster their security teams. As threats and attacks become more prevalent and more prolific, prioritizing cybersecurity will become a matter of survival for businesses in the future. According to Lee, "Everybody is vulnerable. We are going to experience attacks. The real question is, how can we be more responsive and more resilient in the face of those attacks so that the consequence doesn't impact our daily lives?" [127]. Growth in this industry is projected to grow across all business models while simultaneously increasing the value of cybersecurity professionals. As the market grows for experts such as Dragos or Recorded Future, other businesses in the industry will recognize the value of reallocating the necessary funds to elevate their defensive capabilities.

Industry Forecast

Thought Leader: John Pistole
Position: President, Anderson University
Area for Disruption: Climate Change

Professional Insight:

"As climate change prompts the movement away from fossil fuels, this disruptor will affect both the environment and the economy. Disruptive companies like Tesla will continue to move towards battery power, which could change the domestic automobile industry."

Industry Forecast

Thought Leader: Jerry Walker

Position: Director of IT, St. Louis Treasurer's Department

Area for Disruption: Cybersecurity is a focal point, not a side dish

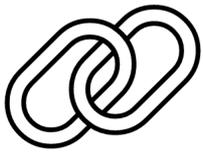
Professional Insight:

“On a state and local level, I think the biggest thing is really taking cybersecurity really seriously. When we build our infrastructure, we build a robust, scalable infrastructure with cybersecurity in mind with best practices and compliance. We've had cities get hit really bad with things that could've been avoided but they didn't bring that level of thought in or that expertise in. It can shut governments down. It can take over \$40 million to get up and running right. Every person working in IT is responsible for security, security has to be front of mind in everything that they do whether helpdesk or CIO. It's a lot to understand.. We provide security awareness training once per year to all employees, and more in-depth cybersecurity for IT departments and more in-depth from there depending on your position in the organization.

It's disruptive in that you're starting to see things people don't want to see. And you are starting to put real compliance in, and it's all built around cybersecurity. When you put real compliance behind things, it changes people's way of doing what they were used to doing business-wise. The office has changed. I do not foresee the office coming back in the way it was before because these companies are finding that productivity is higher, it can be done, and it can work. A lot of these companies are to the point where their people are leaving the city because there's no reason for them to be close to the job site. So how do you as an IT professional play in that and what is going to be needed in that aspect of it. That comes back to cybersecurity – how to secure someone's laptop from home?”

Informational Resources

[10 Global Threats to be Aware of Global Risk Report](#)



Supply Chain & Manufacturing Shifts

1 What is it?

Supply chain, and supply chain management specifically, is the process that encapsulates how companies manufacture raw materials into products and deliver them to customers. Supply chain describes the company's critical activities involved in converting these raw materials to consumer goods. In addition to the activities, the supply chain also defines the network of interconnected companies, information, and additional resources required to make these series of activities possible. While not required, supply chains can span companies in multiple countries within multiple business sectors, each contributing necessary infrastructure to complete the desired product.

Examples of a supply chain include a clothing company. The company may source its cotton from a farmer, which is shipped from the farm via a semi-truck to the manufacturing plant where the cotton is processed into a t-shirt. The t-shirt is then packaged in a bag, either produced in the same warehouse or imported from a bag maker, where it is then shipped to a clothing store, awaiting purchase from the consumer.

Supply chains may be severely disrupted should an incident affect any segment of the interconnected network. The COVID-19 pandemic was one such example of disruption to the global supply chain that has since caused organizations to reconsider their manufacturing processes and determine how technology may be used to digitize their supply chain. A recent Ernst & Young (EY) survey that included 200 senior supply chain executives found that “only 2% of companies who responded to the survey said they were fully prepared for the pandemic. Serious disruptions affected 57%, with 72% reporting a negative effect (17% reported a significant negative effect, and 55% mostly negative)...92% did not halt technology investments. This speaks to the value of a digital supply chain in helping enterprises navigate disruptive forces and respond faster to volatile

supply and demand” [133].

Digital supply chains, or supply chain 4.0, rely on cloud computing to supply the resources necessary to store and analyze vast amounts of data. Artificial Intelligence (A.I.) and Machine Learning can conduct advanced analytics on data collected from Internet of Things (IoT) devices such as sensors that capture environmental conditions and location information of semi-trucks or robotic devices used in a warehouse. The results of these analyses can be leveraged to improve efficiency of the staff and ensure the needs of customers are met with greater accuracy and speed. The data that is consumed throughout the various stages of the supply chain process can be leveraged into greater, actionable insights.

2 How does it work?

To comprehend the acceleration toward digital supply chain management, context surrounding the fourth industrial revolution is necessary. The first, second, third, and now fourth industrial revolutions point to periods of significant growth and change in how the global economy conducts business. The World Economic Forum further builds on this concept by stating, “the First Industrial Revolution used water and steam power to mechanize production. The Second used electric power to create mass production. The Third used electronics and information technology to automate production. Now a Fourth Industrial Revolution...[is] the digital revolution that has been occurring since the middle of the last century. It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres” [134]. As data collection and processing capabilities exponentially increase, the fourth industrial revolution invites supply chains to minimize or eliminate downtime within

the network and increase the accuracy of predictions for product demands and potential failures in manufacturing.

According to Gartner research, to execute the vision of Supply Chain 4.0, companies must invest in technologies such as “IoT to measure performance in real time, analytics to predict failure and automate processes, mobile for ubiquitous data access, and application program interfaces (APIs) to share data with the partner ecosystem” [135].

These technologies work together to create a more efficient supply chain. In current ecosystems, data is often managed in paper-based, manual formats. The master files containing all shipment records, for example, are laborious to update and track and often contain outdated information. In a recent McKinsey report, the issue of not maintaining real-time data to improve processes is readdressed through the lens of Supply Chain 4.0 capabilities. “It is typically not clear which additional data could be leveraged to improve processes such as sensing of supply disruptions. If the lead time of a supplier is continuously increasing, a warning should be sent out to make planners aware of the situation and enable them to mitigate supply disruptions at an early stage. In current systems, this signal will not be recognized and will lead to a lower supplier service level reported at the end of the month. If the worst comes to the worst, the issue will cause trouble in the assembly line replenishment and operational problems” [136]. The cascading effect of poor data capturing and management affects the entirety of the supply chain. Through harnessing a global, interconnected view of data management, organizations can begin to integrate processes and governance to improve the speed and accuracy of prediction and forecasting methods. Where pick paths are a critical component to supply chains, failing to leverage all available data can result in greater costs to the organizations involved in each supply chain.

This point is further established with an example provided in McKinsey’s Supply Chain 4.0 Report. “Warehouse operations are still managed in batches of one to two hours, not allowing the real-time allocation of new orders and dynamic routing. Also, opportunities arising from new devices, such as wearables (e.g., Google Glass) or exoskeletons, are not leveraged” [136]. IoT devices such as the mentioned smart glasses are able to quickly inform warehouse workers as to the location of certain items. In addition to faster decision-making for humans, this

location-based tracking data can be used in powering robotics to accurately locate similar items that may be out of reach or beyond weight-bearing capacity of humans. Programmable-logic controllers (PLCs) enable software to be hardcoded into the machine or robot, allowing the robot to automatically carry out repetitive movements and tasks. Leveraging these robotics systems to update inventory levels in tandem with performing repetitive tasks is an advantage to warehouses and transportation methods.

As warehouses remove the inaccurate manual processes and reposition humans into roles that robots cannot effectively perform, it increases efficiency while reducing costs associated with downtime. Utilizing this data allows organizations to respond in real-time to increasing demand for various products, while scaling production accordingly. In order to optimize Supply Chain 4.0, organizations should consider the aspects of their business that can be digitized and captured according to their specific business. These organizations should simultaneously seek to discover whether the companies they work with at various points of the supply chain capture relevant data that can be used in tandem with business-specific items. Optimizing the entirety of the supply chain has far-reaching implications for organizations’ cost-efficiency, safety, and planning.

3 Who’s doing it?

Spearheading the charge into the digital supply chain are Honeywell and GE Aviation. The acknowledgment of the fourth industrial revolution’s impact on supply chains has been addressed by Paul Crimm, Honeywell’s Chief Engineer of Safety and Productivity Solutions. “At its core, Industry 4.0 is about the transformation of the supply chain. At Honeywell, we’ve been working within multiple points of this value stream – from the distribution center to the retail showroom – to develop new technologies that solve unique problems. We’re finding the key to winning in this revolution is software. Without software, physical devices don’t add much value” [137]. Senior Vice President and Chief Supply Chain Officer at Honeywell, Torsten Pilz, succinctly described how Honeywell has transformed its operations to accommodate the increasing emphasis on digitization, “what historically was a product-oriented industrial conglomerate [Honeywell] was remaking itself as a software-industrial company” [138].

Honeywell, which started as a heating control product provider, purchased two Software as a Service companies in 2020 for a reported \$1.3 billion. The investment into developing technology is a primary focus for this company as the pandemic has revealed the need to be agile and adaptable at all points in the supply chain.

This agility is enabled through recognizing that software powers the data capture and visualization tools. Honeywell has carried this understanding into its hiring practice as it aims to support the organization with those who can effectively work with software. “It’s the combination of intelligence, computing capacity and software that bring products to life – making the idea of a connected distribution center a reality. More than 50 percent of our engineers are software engineers. We are building software that is rapidly moving Honeywell forward into new technology spaces, helping to serve our customers” [139]. To ensure that technology is effectively democratized and that employees are properly involved and trained to handle the changes in the digital supply chain, Honeywell has further invested into its people through providing an academy strictly dedicated to developing these competencies. “Honeywell created a Supply Chain Academy to teach its employees new ways of working, designed global models for most of its processes and standardized many of its organizational roles, the combined outcome of which is a data-ready workforce to match the company’s data-ready infrastructure” [137].

As organizations consider the implications of strained supply chains and delayed manufacturing cycles, Honeywell is proof that the transition into digital supply chain management can be made regardless of starting point.

GE Aviation has similarly trekked into lightly chartered waters in reimagining the digital supply chain. Using “Digital Twins”, or digital replicas of their physical counterparts, GE Aviation is honing technology that, while serving as a tool for greater insight into aircraft engine maintenance, also has broader implications for manufacturers and warehouses worldwide. Chief Architect at GE Aviation Joe Dunsdon shares a specific vantage point for the implications of digitized supply chains, “imagine a virtual model of your body that doctors could experiment on and use to diagnose health issues before they became real problems. This is how engines are being monitored in aviation, and eventually the

same technology could be used on people, too. As we’re in the factory, we build a digital copy of an engine’s materials, and the way in which it is machined and manufactured, then, through its life, we can keep a working replica of the physical version, to understand its experience and the state it’s likely to be in” [140].

This process is enabled by sensor technology that allows for real-time diagnostic testing of the engines and is applicable to warehouse devices and assembly line devices. Perhaps the greatest value in digitizing and predictive analytics is the cost savings to companies. “It’s estimated that airlines lose \$81 every minute a plane sits idle on the tarmac or in the air. Digital twins are arguably of even greater value to customers, who will face far fewer cancelled and delayed flights” [140]. Rather than driving predictions through quarterly data, companies will continue to develop these technologies to create real-time predictions and accurate representations of how to become safer and more efficient.

4 Why is it significant?

The true impact of Supply chain 4.0 resides in creating greater cost efficiency, enhancing response times to changes in supply or production alterations, reducing error and waste, safety improvements, and greater visibility of data throughout the supply chain. Rand McNally leverages insights from a 2016 DAT survey to demonstrate the value of optimizing for efficiency and safety. “According to a DAT survey [of] 257 carriers in 2016, 54% of drivers say they wait anywhere between 3-5 hours every time they are at a shipper’s dock. Those 3-5 wasted hours of service cost truck drivers between \$1,281 to \$1,534 a year. On an industry scale, that’s over \$1 billion annually... Truck drivers are not allowed to be on duty for more than 14 hours in a day. They are also not allowed to drive more than 11 hours in a day” [141].

These constraints amplify the value in maximizing every moment of supply chain activities. Many issues in the supply chain stem from reactive responses rather than proactive responses. In the case of the truck driver, anticipation of driver arrival times, for example, can drastically reduce time and costs incurred from waiting for the transfer of shipment loads. Significant injuries are also tied to these shipments and warehouse processes.

“According to the National Institute of Standards and Technology (NIST), 94,750 forklift-related injuries are reported each year and every 3 days someone is killed in a forklift-related accident” [141]. Many of these issues stemming from faulty trailer gear, improper separation from the dock, and nuanced details such as trailer fasteners would be ameliorated through less pressurized, on-time environments. In addition, real-time sensors that proactively predict equipment breakdowns as exemplified at GE Aviation would allow for preventative maintenance on all faulty equipment.

The infrastructure that provides these advanced analytics to improve safety and efficiency cultivates processes that improve cost-efficiency and the customer experience. The implications of this technological infrastructure are captured by McKinsey’s study on Supply Chain 4.0. “Low customer service is either driven by a wrong promise to the customer (e.g., unrealistic lead times), a wrong inventory profile (ordered products are not available), and/or an unreliable delivery of parts. Lost sales in addition occur if the required products are not available on the shelf or in the system...Driven by transportation, warehouse, and the setup of the overall network, the costs can be reduced by up to 30 percent. Roughly 50 percent of this improvement can be reached by applying advanced methods to calculate the clean sheet (bottom-up calculation of the ‘true’ costs of the service) costs of transport and warehousing and by optimizing the network - the goal should always be to have minimal touch points and minimal kilometers driven, still meeting the required service level of the customer...The remaining 15 percent cost reduction can be reached by leveraging approaches of dynamic routing, Uberization of transport, leveraging autonomous vehicles, and - where possible - 3-D printing. With advanced system support, 80 to 90 percent of all planning tasks can be automated and still ensure better quality compared to tasks conducted manually” [136].

With more dynamic control and flexibility of manufacturing processes and supply tracking, companies can shift forecasting models to account for up to daily or hourly data rather than traditional quarterly models. Because greater accuracy and timing are achievable through capturing predictive metrics, profit margins have increased, thus enabling direct-to-consumer practices.

As Honeywell Executive Torsen Pilz states, “by

connecting production machines to sensors and software that measure and analyze inputs — everything from temperature and humidity to air flows— against outputs, factory automation helps companies optimize production processes in ways that minimize waste and maximize yield. By joining and analyzing data that is external to factories — for example, information about procurement, inventory management, warehousing and transportation — non-factory automation can similarly increase cost-effectiveness, efficiency and productivity” [139]. While Supply Chain 4.0’s impact will vary by industry, the ramifications of successful technological integration will significantly impact an organization’s ability to withstand and adapt to disruption. In a global 400-company study conducted by McKinsey, they found that “94 percent of respondents told [them] that Industry 4.0 had helped them to keep their operations running during the [COVID-19] crisis, and 56 percent said these technologies had been critical to their crisis responses. ...56 percent of respondents that hadn’t implemented Industry 4.0 technologies prior to COVID-19 found themselves constrained in their ability to respond to COVID-19 in the absence of digital technologies to support them” [142]. These technologies allow for innovation that may lead to reducing exposure to an overly complex and large supply chain. Along with performance metrics from devices, companies should aim to enhance employee productivity to optimize efficiency. The digital technologies that enable more efficient supply chains also lend themselves to this employee development. As seen with the smart glasses, employees are provided with real-time support in warehouse environments. The integration of these technologies can have a profound impact on employee-related processes; through combining augmented and virtual reality – known as mixed reality – companies may reduce hours in training by 4 times [143].

In addition to the improved safety precautions now available through predictive analytics and proactive responses to equipment failures, mixed reality allows employees to prepare for disaster events in a safe, virtualized environment. As data is collected throughout the supply chain, it may be integrated into the situational training of these employees.

Despite the countless benefits to be gained from Supply Chain 4.0, companies must also be aware of the impact this total integration has on privacy, cybersecurity, and personal data management. Customer-driven insights greatly impact how companies market, design, and deliver products, ultimately

allowing operations to become more transparent to the end user. There must be equal, if not greater, consideration to securing technological environments as there is in implementing the technology itself.

From handling robotics machinery to visualizing the supply chain environment in real-time, democratizing technology and information will empower companies to become more efficient in managing costs, customer relationships, and employee development. Through careful planning and taking small steps toward a more fault tolerant infrastructure, organizations can reap the full benefits inherent to Supply Chain 4.0.

5 What are the downsides?

The April 2021 ransomware attack on the Colonial Pipeline resulted in a paid ransom of \$4.4 million and hundreds of gigabytes of data stolen [144]. This is critical in understanding that, despite the main business' core function being to supply 45% of the East Coast's fuel supply, many organizations in addition to the Colonial Pipeline have online processes susceptible to vulnerabilities. In this case, the Colonial Pipeline infrastructure was hacked to expose the billing information of companies such as Shell and Koch Industries, creating errant transactions for these companies.

While digitized supply chains offer access to exponential efficiency and productivity, they are vulnerable to cybersecurity attacks. Specifically pertaining to software, the linchpin in digitized supply chains, Bloomberg highlights the risks associated with updates and consistent maintenance associated with this software-based model. "Software and firmware updates that are authenticated as legitimate and come directly from the company receive minimal scrutiny. They are routinely tested by IT departments to ensure compatibility with existing programs, not to look for backdoors...because the supply chain for electronic components and software code is vast, closing any potential security holes can be among the most challenging assignments for large companies and government agencies, let alone for smaller organizations" [145]. Backdoors refer to methods used by hackers to circumvent standard security measures such as password protections and dual authentications. As exemplified through the Colonial

Pipeline, hackers may leverage these backdoors to take over entire systems, changing the code this software operates with and compromising the entire network of clients and financial information.

Companies must be vigilant in their awareness of the security standards of each company within the ecosystem. Organizations who maintain robust cybersecurity protocols may fall victim to escalated attacks – attacks whereby the credentials and permissions of an outside vendor are compromised and leveraged to make their way into the infrastructure of the otherwise secure organization. BitSight, a third-party cybersecurity management company, illustrates this scenario through the example of the 2020 SolarWinds breach. "Microsoft, which had used SolarWinds Orion software, revealed that the hackers behind the cyber-attack were able to escalate access inside Microsoft's internal network to view their source code repositories. The SolarWinds incident shows us that monitoring the security of one's own third-party network is insufficient. True digital supply chain security demands knowing not just that your technology vendors are secure, but that their vendors are secure (and so on)."

The consideration of those organizations within the vendor network, four, five, and even six companies removed from the central organization, presents many challenges for managing the security of the supply chain ecosystem. As companies aim to digitize their processes, they must be aware of the security ramifications connected to each choice. From previously mentioned Google Glass and robotics devices, companies must assess the security of their data from all sources, including those from their partners and network.

6 Where is it going?

The future impact of supply chain 4.0 is captured by McKinsey in a recent survey. "These new technologies [predictive analytics in demand planning and machine learning approaches specifically] enable a significant improvement of demand forecast accuracy, often reducing the forecasting error by 30 to 50 percent... The potential impact of Supply Chain 4.0 in the next two to three years is huge - up to 30 percent lower operational costs and a reduction of 75 percent in lost sales while decreasing inventories by

up to 75 percent are expected, at the same time increasing the agility of the supply chains significantly” [136]. For these returns on investment and process to be realized, there are significant investments required in the areas of cloud computing, data storage, and advanced data analytics.

Cloud computing serves as the infrastructure of Supply Chain 4.0, as it provides companies with the ability to expand and contract computing resources on-demand. Stored in an offsite, third-party managed data center, cloud computing is offered as an “as a Service”, pay-as-you-go pricing model. Because companies can scale resources according to need, ingestion of data from the increasing number of IoT devices can be efficiently managed, experimented, and refined. The cloud, in conjunction with this IoT data, will serve as the infrastructure for more advanced machine learning models, especially as it relates to the previously mentioned creation of digital twins. As Joe Dunsdon, Chief Architect at GE Aviation states, “using real-time data gathered by aircrafts to simulate each flight, fleets operate more efficiently, facilitate quicker recovery from weather events, and improve fuel efficiency. This is very much where all industries are going, it is where personalized medicine is going, for example. As we get a better understanding of ourselves as humans, about our genomes and experiences and genetics, you start to see this being possible at a human level and across all industries” [140].

The sensors that enable the capturing of this real-time data will become ubiquitous in manufacturing processes and supply management within other industries. The further use of technology such as smart glasses, augmented reality (AR), and robotics will shape the path forward. Smart glasses provide hands-free, digital information that will increase productivity and remove the reliance on barcode scanners and paper-based tracking with inventory. DHL, the international delivery company, has experimented with smart glasses and experienced meaningful results. “The smart glasses provide visual displays of order picking instructions along with information on where items are located and where they need to be placed on a cart, freeing pickers’ hands of paper instructions and allowing them to work more efficiently and comfortably. The international trials have shown an average improvement of productivity by 15 percent and higher accuracy rates. The user-friendly and intuitive solution has also halved on-boarding and training times” [146].

The value of this technology is further amplified when paired with Augmented Reality (AR).

Augmented Reality is the layering of digital information on top of the existing physical environment. Whereas virtual reality is an entirely computer-generated reality, AR allows the user to combine virtual, digital information with their environment. Enabling the real-time scanning of the environment, AR technology can quickly inform the worker as to whether the needed product is in their proximity or in an entirely different location. Layering virtual maps of the warehouse over the employee’s limited physical spatial awareness will enable accuracy and efficiency in inventory management and fulfillment.

Robotics represents the opportunity to automate otherwise redundant tasks while introducing greater speed, precision, and efficiency to these tasks. Advanced robotics provide a viable substitute for humans in dangerous environments, as proven by GE. “These specialized robots are designed to crawl along the bottom of storage tanks to check for corrosion or through pipes to search for wall thinning that indicates corrosion. The company also developed solutions that combine specialized inspection and maintenance. Its Boiler Wall Cleaning & Inspection (BWCI) Robot, for example, is designed to inspect—and clean—boiler waterwalls, the welded array of tubes that carry water through the boiler for heating” [147]. While these technologies are in development and are serving niche needs seemingly unrelated to current supply chain management paradigms, their technology will become transferable to trucks, warehouses, tracking systems, and manufacturing. 3-D printing technology, for example, may change how entire products are designed, shifting away from heavy, expensive machinery and long production cycles into hours-long printing sessions. These products may change which supplies are required to be shipped and the number of raw materials needed to achieve an intended outcome. In addition, supply chains will get shorter as these technologies allow for more direct relationships with consumers.

Imagine a manufacturing facility that 3-D prints its products, then utilizes a drone to deliver the product directly to the consumer. The entire supply chain consisting of semi-trucks, hand-off warehouse locations, and inventory tracking would be disrupted and transformed. Much in the same way that the advent of digital video technologies disrupted Kodak’s film business, products and technologies that currently

serve different needs and sectors will have wide-ranging, global impacts on supply chains.

Despite the potentially lucrative opportunity that the comprehensive shift into Supply Chain 4.0 represents, it is still recommended that organizations begin small and remain intentional in their process. Carefully identifying where current gaps in the supply chain lie, as well as which technology is most relevant to their specific and present situation, are critical considerations. Starting slow avoids unnecessary and costly investments into technologies that the remaining supply chain is not prepared to support and leverage. Altering paradigms and modes of thinking may be the most crucial first step for many organizations as they begin to consider how to begin digitizing their operations environment. Having a keen eye on the near future will ensure that companies are less vulnerable to severely compromised supply chains produced by events such as COVID-19.

Industry Forecast

Thought Leader: Ryan Nelson

Position: Owner, Late Harvest Kitchen

Area for Disruption: Third-Party Delivery

Professional Insight:

“Services like DoorDash, UberEats, GrubHub are the biggest change to the restaurant industry since online reservations. These services have exploded since the pandemic, and using them has become routine. They charge a significant premium and create a challenge for restaurants that are unable to fully open during the pandemic. Restaurants will change business models to adapt. Large restaurant companies are building facilities called “ghost kitchens” that exclusively service third-party delivery. Other restaurants function as “restaurants within restaurants”, where food is produced by one restaurant at another exclusively for delivery.”

Thought Leader: Frederic Franssen

Position: CEO, Certell, Inc.

Area for Disruption: Supply Chain Management

Professional Insight:

“There is going to be a huge premium on diversification of supply chains. China will no longer be where everyone wants to do business. This process will be regulated by the federal government, intruding national security into lots of business decisions. It will interfere with cost-efficiency as the principal criterion for outsourcing, causing lower potential output. It will create significant winners in other developing countries—India, of course, but also in Africa and parts of Latin America. This will take longer to really show, but will be evident in 5-10 years in the growth of economics in new and unexpected places.”

Informational Resources

[Technology in the Supply Chain](#)

[Digital Supply Chains](#)

[Supply Chain Development](#)



Changing Workplace Demographics

1 What is it?

This section will highlight the impacts of changing workforce demographics on business practices. It will prove useful to review the Shifts in Workplace Demographics section from the Management and Leadership Trends to gain a holistic view of expected changes regarding demographic shifts.

Millennials have become the largest generation in the workforce, making up 35% of the entire American workforce with 56 million people [148]. As the population ages and workforce demographic shifts, businesses will continue to see different forms of talent arise. Professionals that are tech-savvy at a younger age but lack the interpersonal skills of an experienced workforce will become more common. Additionally, shrinking working-age populations on a global scale will require businesses to adapt and pivot toward automated systems. Even in China, a country that historically has an excess of laborers, the workforce is forecasted to “decline by 35.7 million people during the 2018-2030 period, the largest decline in the world” [149].

Additionally, diversity rates amongst the workforce will continue to rise, and businesses who recognize this growth opportunity will quickly lead markets. A robust culture that represents the values, vision and behaviors of their workforce will engage a greater demographic and retain employees longer.

As an aging workforce impacts business decisions, leaders must recognize how they can attract talent and, more importantly, retain their workforce. New generations have different expectations and demands regarding transparency, compensation, social responsibility, and flexibility.

2 How does it work?

Businesses and leaders must pay attention to competitive work environments and a more agile workforce than previous generations. It is no longer common for workers to stay in the same role or even at the same organization for the majority of their career. Data from a Gallup report indicates that Millennials are the job-hopping generation, moving freely from company to company more frequently than any other generation [150]. This trend is expected to continue with even younger generations entering the workforce.

Millennials and younger generations are not only interested in finding a good job, they are willing to research and investigate positions with many companies. They are consumers of the workplace, actively engaging with it. Companies must be sure to not only present inclusive values, but live by them from the CEO to the new hire. This will ensure maximum competitive advantage and will benefit the businesses because they will be able to leverage diversity as one of their greatest strengths.

The next wave of employees will be the most educated in the workforce, and businesses should not disregard the input of junior level employees purely based on experience. As organizations learn to leverage their knowledge, they will share their ideas and optimize business operations. Many businesses have already adopted lean approaches to management, which will prove useful as workforce demographics continue to shift.

3 Who's doing it?

Microsoft has one of the most complete diversity and inclusion numbers of any large technology-enabled company.

Not only do they have policies enforcing gender diversity and inclusive practices in their workplace, they are also actively achieving high marks in this space. Regarding racial and gender diversity, 39.7% of the company's board was made up of racial and ethnic minorities in 2020. Additionally, their workforce as a whole was nearly 50% racial or ethnic minorities [151]. Microsoft still has room to grow, particularly in the area of gender diversity, with only 28.6% of its employees and 26.3% of its managers being women.

Centene, a multi-line managed care enterprise, has a generational workforce containing professionals from five different generations. 39% of their employees are millennials, 42% are from Gen X, and 18% are Baby Boomers. Additionally, 75% of their employees are female and nearly 50% of their workforce identify as people of color [152].

4 Why is it significant?

Demographic shifts in the workforce are significant because leaders and businesses must be prepared to not only make larger investments to attract and retain their workforce, but to leverage the powers of diversity to their advantage. Workforces are changing, and this trend will continue; as such, understanding how to navigate employees from different generations, countries, and socioeconomic and cultural backgrounds is critical. Diverse teams are 70% more likely to capture new markets and 87% better at making decisions [153].

Knowledge management will play an essential role in ensuring operational knowledge is retained as older generations leave and newer ones start their roles. Companies must develop comprehensive training and knowledge management systems that engage new and retiring employees alike. Capturing the best practices of older employees and leveraging that in training for new hires will be critical to keeping a high pace of understanding between clients, industries, and regions [154]. New technologies and digital experiences will make this process easier for younger generations that have the means and desire to access content in different formats.

Additionally, businesses must leverage stronger HR processes to ensure time-to-work for new hires is

reduced and their training is maximized. Leadership must “conduct succession planning that regularly identifies and cultivates top talent in a formalized manner” [154]. Planning and career support should be a priority if companies wish to retain skilled employees, but also to recognize that you want them to experience future growth at your business.

5 What are the downsides?

As workforce demographics continue to shift, there are some inherent disadvantages that businesses and leaders should be aware of. With older and more experienced members of the workforce retiring or leaving their roles, businesses must leverage more in-house training as they experience a talent pool that has less experience. With a less-experienced workforce and higher turnover rates, businesses may be unable to operate at the same capacity they are used to in the short term [155]. Additionally, sponsored professional certifications are also sought after, and companies will likely be pressured to pay or compensate new hires for certifications and other training.

Some businesses may suffer from talent shortages and general lack of experience in their industry, causing them to look outside of their community or region for talent. Covid-19 created larger talent pools due to the rise of remote work, meaning there is much more competition on the marketplace for top talent.

Additionally, as more businesses hire and retain a diverse team of employees, there will undoubtedly be communication barriers and challenges. Management must be intentional with requiring diversity and inclusion training for their workforces. Relatedly, leaders will need to ensure there are adequate resources to support communication barriers that result from having a diverse workplace.

6 Where is it going?

In the next few decades, we will see massive shifts in demographics that will change the workforce and the workplace forever. Traditionally underrepresented groups will turn into majority populations by 2044 due to growth from Hispanic, Asian, and

multiracial groups. Additionally, by 2065, the United States will not have any single ethnic or racial majorities [153]. Although these shifts are more than a decade away, the years leading up to them will be pivotal moments for many communities. Relatedly, companies will be criticized and feel public backlash for not cultivating diverse cultures within their organizations. Only 7.4% of Fortune 500 CEOs are women, while they make up nearly half of the workforce [Source - fundera]. Demographic changes will continue to shift and businesses will be impacted in nearly every way. Traditional markets are evolving and leaders must continue adjusting their practices to create environments where demographic diversity is welcomed and encouraged.

Industry Forecast

Thought Leader: Jay Ray

Position: Technology Operations Manager, UW-Madison Libraries

Area for Disruption: The Younger Workforce

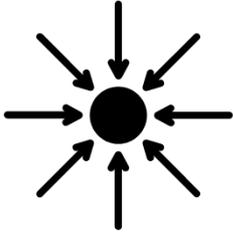
Professional Insight:

“A younger workforce is one that includes a growing number of people in their early career and may disrupt a number of business processes due to their divergent views from their predecessors and increased comfort with technology. The significance of a workforce the likes of the Baby Boomers retiring can't be overstated. The workforce will be in a major state of transition for a time with many jobs held by upcoming retirees transitioning to a younger generation, with potentially wildly different priorities, views, and approaches to work. In addition, younger generations will have expectations around their use of technology during the workday that previous generations did not have. It is hard to say what the true impact will be. I mentioned that the value placed on diversity of upcoming generations is much higher and will affect offices everywhere. In addition, however, signs point to a more transient workforce focused on a feeling of loyalty and more on personal satisfaction. This will affect how businesses need to approach their workforce, including the focus placed on employee engagement and professional development, instead of just salaries and benefits.”

Informational Resources

[Managerial Implications of a Changing Workforce](#)

[The Aging Workforce](#)



Convergence

1 What is it?

The Convergence is the cumulative effect of every disruptor mentioned so far. The key point of the Convergence is that it will lead to broad and exponential impact from the individual innovations described above. Each of them is highly significant on their own; our experts referred to each disruptor and their anticipated impacts multiple times. But, when you put them together in pairs and broad combinations, they quickly become exponential. The Convergence will also drive the accelerating pace and amount of change and make it more challenging to anticipate precise outcomes. These synergies will ripple through all of the technical innovations and the business and leadership practices outlined in this report. The entire list will be synergistic and exponential at peak convergence.

2 How does it work?

To better explain the potential impact of the Convergence, utilizing an example will prove useful. When observing the rapid change surrounding Artificial Intelligence (AI) and Internet of Things (IoT) there is a clear synergy taking place that, when compiled, has enormous impact. As the amount of collected data continues to grow from the use of IoT devices, the need for strong AI systems to analyze and comprehend the data will also rise. The effect of one technology is directly paired to the growth factor of another. This is Convergence. At a much larger scale, you can begin to imagine the implications from each of these disruptors compounding onto each other, relying on each other, and directly impacting the growth of each other.

Businesses and organizations are able to collect incredible amounts of data from customers via a plethora of sources, including social media, advertisements, and, most notably, from IoT devices

such as a smart home device, smart watch, electric car, smart thermometer, etc. This data is nearly useless without AI systems that can actively discover the important insights hidden within. AI can help businesses truly understand the most important pieces of the collected data, leading to better automation, stronger predictions, and, when necessary, intervention. The convergence of these two disruptors has the possibility for exponential impacts.

Applying this same level of synergy and convergence to any pair or broad combination of innovations listed in this report will yield similar levels of compounded impact. Convergence will not respect the three boundaries we have identified in this report; it will, however, merge and blend various elements of each innovation, enabling incredible amounts of change and disruption at a global scale.

3 Who's doing it?

During the time this report was written, in 2021, we are experiencing a convergence of factors that have impacted every aspect of our lives. As the fallout of Covid-19 continues, we are witnessing the convergence of Biotechnology and Digital Medicine with Supply Chain and Manufacturing Shifts. As the medical industry continues to evolve due to Covid-19, biotechnology and digital medicine are on the rise. We are experiencing massive investments into vaccine research and optimization, along with a surge in telehealth and digital medicine. Additionally, we are experiencing massive supply chain shortages for almost every product. Covid-19 has caused massive disruption at a global scale, specifically in how services and goods are delivered. According to Accenture, 94% of Fortune 1000 companies are experiencing supply chain disruption, 75% of companies have

had negative impacts on their business, and 55% of companies plan to downgrade their growth outlooks, or already have [156].

Covid-19 pushed an array of systems to their breaking point, and the convergence of supply chain shifts and manufacturing trends, alongside an evolution of digital health and biotechnology, exemplifies how two very different disruptors can create significant barriers and complications when they occur at the same time.

4 Why is it significant?

Convergence is significant not only because of the vast risk potential that exists when these factors are combined and extrapolate onto each other, but because it makes it significantly more difficult to predict precise outcomes. Convergence will generate more possibilities outside of the Cone of Possibilities. Additionally it will serve as a tool for navigating and anticipating the potential impacts of what is coming.

The Cone of Possibilities is a tool that is used in future and foresight studies to anticipate the opportunity for many futures.

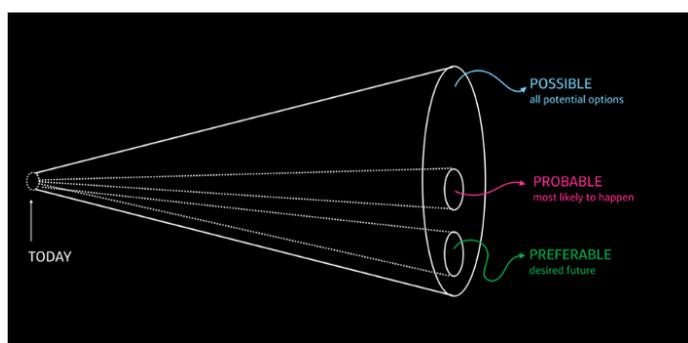


Figure 1. Medium - Cone of Possibilities

Figure 1. illustrates the four parts of the cone - the apex, the largest cone, the most probable cone, and the preferred cone. The apex is today, where we currently are. The largest cone identifies the entirety of future possibilities, while the most probable cone is most likely to occur and the preferred cone is the desired future [157].

Convergence not only expands the possibilities of the largest cone, but it impacts the most probable and preferred spreads as well. As these disruptors are combined and, in some cases, happening simultaneously, our future outlooks will change and the cone of possibilities will continue to get bigger. Businesses are striving for their desired outcome and are generally investing resources to ensure they are aware of the most probable outcome. But, as the potential for outcomes becomes wider and the possibilities continue to expand, our ability to control the tertiary factors diminishes.

5 What are the downsides?

The biggest inherent downside to Convergence is the unknown potential and inability to predict or properly anticipate precise outcomes. Businesses will need to invest additional resources to better analyze how the convergence of various factors will impact their success. Risk mitigation and planning at an unprecedented scale will be essential to the survival of smaller firms who don't have the resources or capital to sustain a convergence of threat factors. It is important to note that convergence is not inherently negative; there are an array of innovations outlined in the previous sections that, when combined, cause businesses to grow and evolve faster than before. The pace and amount of change will increase beyond their current levels, causing further disruption and opportunity in some cases for business to evolve.

6 Where is it going?

Such synergies will ripple through all of the technical innovations and the business and leadership practices. The entire contents of this report will be synergistic and exponential when combined. We will experience a future with more unknowns and equally as many potential outcomes that will impact our ability to plan and prepare. As the more positive disruptive factors and innovations align, like AI and IoT systems, we will experience technological evolution at an unprecedented rate. The pace and amount of change will continue to expand and companies will be forced to adjust their business models to reflect rapid fluxes of growth and recession. Leaders will become more agile in their processes and approaches

to management, and emotional intelligence will become an essential component of every successful enterprise.

Industry Forecast

Thought Leader: Matt Bruening

Position: VP of Global Technology Planning, AT&T

Area for Disruption: The speed of technology, the capability of the richness of applications, the broadening of entertainment and real experience. I think that that's one of the last frontiers.

Professional Insight:

“I think it is tremendously interesting. [an example] is very well done virtual reality. I think [VR] is enabled with sufficient bandwidth and computing power for that sort of virtual engagement and the engagement becomes richer through more sensation feedback. Maybe even smell, certainly sight and hearing are covered pretty well, but if there can be a real sense of motion and all of the senses engaged. That's a tremendous amount of data to do it well and to do it accurately. But I think that the entertainment value, the consumption for something like that of consumers for hours and hours, you know, every day. Does it have any impact on travel around because you're having those experiences that are maybe better because you're not standing in a long line to see the Colosseum in Rome, because you're getting that full AR VR and it's self directed you want to go down to the catacombs. You want to climb to the highest if you can, and it's on your own. It's as if you were there.”

Informational Resources

[Thinking Differently about the Future\(s\)](#)

[Synergy of IoT and AI](#)

[Robotics and Automation Case](#)

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